UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to NMFS No:
2011/05585

April 5, 2012

Kevin Moynahan
U.S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, Oregon 97208-2946

Joyce Casey
U.S. Army Corps of Engineers, Portland District
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Endangered Species Act Section 7 Formal Programmatic Opinion, Letter of Concurrence, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Revisions to Standard Local Operating Procedures for Endangered Species to Administer Actions Authorized or Carried Out by the U.S. Army Corps of Engineers in Oregon (SLOPES IV In-water Over-water Structures)

Dear Mr. Moynahan and Ms. Casey:

The enclosed document contains a programmatic biological opinion (opinion) and letter of concurrence prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the effects of a program implementing standard local operating procedures (SLOPES) for Department of Army (Corps) activities involving in-water or over-water structures (including pile driving, access management, and minor discharges) in Oregon and the south shore of the Columbia River and its tributaries as authorized by the Corps authority under section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act, or as carried out by the Corps as part of civil works programs authorized by sections 206, 536, and 1135 of the Water Resources Development Act.

In this opinion, NMFS concluded that the proposed program and actions authorized under that program are not likely to adversely affect the Eastern distinct population segment of Steller sea lion (*Eumetopias jubatus)*. The Steller sea lion do not have critical habitat designated in the action area.

NMFS also concluded that the proposed program and actions authorized under that program are not likely to jeopardize the continued existence of the following 17 species, or result in the destruction or adverse modification of their designated critical habitats.

- Lower Columbia River Chinook salmon (*Oncorhynchus tshawytscha*)
- Upper Willamette River spring-run Chinook salmon
- Upper Columbia River spring-run Chinook salmon
- Snake River spring/summer-run Chinook salmon
- Snake River fall-run Chinook salmon
- Columbia River chum salmon (*O. keta*)
- Lower Columbia River coho salmon (*O. kisutch*), critical habitat not designated or proposed
- Oregon Coast coho salmon
- Southern Oregon/Northern California Coasts coho salmon
- Snake River sockeye salmon (*O. nerka*)
- Lower Columbia River steelhead (*O. mykiss*)
- Upper Willamette River steelhead
- Middle Columbia River steelhead
- Upper Columbia River steelhead
- Snake River Basin steelhead
- Southern green sturgeon (*Acipenser medirostris*)
- Eulachon (*Thaleichthys pacificus*).

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agency must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species, except for eastern Steller sea lion.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes one conservation recommendation to avoid, minimize, or otherwise offset potential adverse effects on EFH. This conservation recommendation is a subset of the ESA take statement's terms and conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendation, the Federal action agency must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH response and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

Please direct questions regarding this opinion to Marc Liverman at 503.231.2336 or Ben Meyer at 503.230.5425, of my staff in the Oregon State Habitat Office.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

cc: Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Department of Parks and Recreation
Oregon Department of State Lands
Oregon State Marine Board
Oregon Watershed Enhancement Board
Pacific Northwest Waterways Association
Port of Portland
U.S. Fish and Wildlife Service

Endangered Species Act Section 7 Formal Programmatic Opinion, Letter of Concurrence
and
Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Conservation Recommendations

Revisions to Standard Local Operating Procedures for Endangered Species to Administer Actions Authorized or Carried Out by the U.S. Army Corps of Engineers in Oregon
(SLOPES IV In-water Over-water Structures)

NMFS Consultation Number: 2011/05585

Federal Action Agency: Army Corps of Engineers,
Portland District, Operations and Regulatory Branches

Affected Species and Determinations:

ESA-Listed Species	ESA Status	Is the action likely to adversely affect this species or its critical habitat?	Is the Action likely to jeopardize this species?	Is the action likely to destroy or adversely modify critical habitat for this species?
Lower Columbia River Chinook salmon	T	Yes	No	No
Upper Willamette River Chinook salmon	T	Yes	No	No
Upper Columbia River spring-run Chinook salmon	E	Yes	No	No
Snake River spring/summer run Chinook salmon	T	Yes	No	No
Snake River fall-run Chinook salmon	T	Yes	No	No
Columbia River chum salmon	T	Yes	No	No
Lower Columbia River coho salmon	T	Yes	No	N/A
Oregon Coast coho salmon	T	Yes	No	No
Southern Oregon/Northern California coasts coho salmon	T	Yes	No	No
Snake River sockeye salmon	E	Yes	No	No
Lower Columbia River steelhead	T	Yes	No	No
Upper Willamette River steelhead	T	Yes	No	No
Middle Columbia River steelhead	T	Yes	No	No
Upper Columbia River steelhead	T	Yes	No	No
Snake River Basin steelhead	T	Yes	No	No
Southern green sturgeon	T	Yes	No	No
Eulachon	T	Yes	No	No
Steller sea lion	T	No	No	N/A

Fishery Management Plan that Describes EFH in the Action Area	Would the action adversely affect EFH?	Are EFH conservation recommendations provided?
Coastal Pelagic Species	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Pacific Coast Salmon	Yes	Yes

Consultation
Conducted By: National Marine Fisheries Service
Northwest Region

Issued by: [signature] for
William W. Stelle, Jr.
Regional Administrator

Date: April 5, 2012

TABLE OF CONTENTS

GLOSSARY

For this consultation –

Access management means to maintain vessel access to previously authorized docks, wharfs, mooring structures, and boat ramps by maintaining an existing dredge prism.

Action means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by a Federal action agency.

Action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

Applicant means any person who requires formal approval, authorization, or funding from a Federal action agency as a prerequisite to conducting the action.

Bankfull elevation means the elevation at which a stream first reaches the top of its natural banks and overflows, and is indicated by the topographic break from a vertical bank to a flat floodplain or the topographic break from a steep slope to a gentle slope.

Conserve, conserving, and conservation mean to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Federal Endangered Species Act are no longer necessary.

Conservation recommendation means a suggestion by NMFS regarding a discretionary measure to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information.

Critical habitat means any geographical area designated as critical habitat in CFR part 226.

Cumulative effects means those effects of future state or private activities, not involving Federal action, that are reasonably certain to occur within the action area of the Federal action subject to consultation.

Discharge means the placement of material below the plane of the ordinary high water mark or the high tide line.

Design life means the projected life (in years) of a new structure or structural component under normal loading and environmental conditions before replacement or major rehabilitation is expected.

Dredge prism means the location, width, depth, and length of a dredged area.

Effectively isolated from the active stream means an area that is inaccessible to fish and that cannot allow a visible release of pollutants or sediment into the water.

Effects of the action means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline.

Endangered species means a species that is in danger of extinction throughout all or a significant portion of its range.

Environmental baseline means the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process.

Estuary or other saltwater area means an area with maximum intrusion of more than 0.5 ppt measured at depth; in the Columbia River, this includes all areas downstream from Jim Crow Sands (river mile 27).

Fill means any material that has been placed below the plane of the ordinary high water mark or the high tide line.

Fishery biologist means a person that has an ecological education, thorough knowledge of aquatic biology and fish management, and is professionally engaged in fish research or management activities; a supervisory fishery biologist is professionally responsible for the supervision of biologists and technical staff engaged in fish research or management.

Functional floodplain means an area that is interconnected with the main channel through physical and biological processes such as periodic inundation, the erosion, transport and deposition of bed materials, nutrient cycling, groundwater recharge, hyporheic flows, the production and transport of large wood, aquatic food webs, and fish life history. These processes interact to create and maintain geomorphic features such as alcoves, backwaters, backwater deposits, braided channels, flooded wetlands, groundwater channels, overflow channels, oxbows or oxbow lakes, point bars, ponds, side channels, and sloughs. These features may be difficult to distinguish on smaller streams, where floodplain deposits are subject to rapid removal and alteration. These permanent or intermittent geomorphic features are extensions of the main stream channel and are critical to the survival and recovery of ESA-listed salmon and steelhead. The functional floodplain area is often assumed to be coincident with the flood prone area, if the entrenchment ratio is less than 2.2, or 2.2 times the active channel width if entrenchment ratio is greater than 2.2. This area may also be reduced by the presence of geomorphic features, flow regulation, or encroachment of built infrastructure.

Grounding out means the structure or vessel rests on the substrate.

Harm means significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

Hazardous material means any chemical or substance which, if released into an aquatic habitat, could harm fish, including, but not limited to, petroleum products, radioactive material, chemical agents, and pesticides.

Incidental take means takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal action agency or applicant.

Indirect effects means effects that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Interdependent actions means actions that have no independent utility apart from the action under consideration.

Interrelated actions means actions that are part of a larger action and depend on the larger action for their justification.

In-water work means any part of an action that occurs below ordinary high or within the wetted channel, *e.g.*, excavation of streambed materials, fish capture and removal, flow diversion, streambank protection, and work area isolation.

Jeopardize the continued existence of means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.

Large wood means a tree, log, rootwad, or engineered logjam that is large enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull channel width of the stream in or near which the wood occurs.

Listed species means any species of fish, wildlife, or plant which has been determined to be endangered or threatened under section 4 of the Federal Endangered Species Act.

Minor discharge means a discharge of dredged or fill material below the plane of the ordinary high water mark or the high tide line that does not exceed 25 cubic yards, and will not affect more than 0.1 acres.

Minor excavation means a removal of material that does not exceed 25 cubic yards.

Natural water means all perennial or seasonal waters except water conveyance systems that are artificially constructed and actively maintained for irrigation.

Ordinary high water (OHW) elevation means the elevation to which the high water ordinarily rises annually in season, excluding exceptionally high water levels caused by large flood events. The ordinary high water elevation is typically below the bankfull elevation. The ordinary high water elevation is considered equivalent to the bankfull elevation if the ordinary high water lines are indeterminate.

Permittee - see applicant.

Pesticide-treated wood means wood treated with compounds such as chromated copper arsenate (CCA), ammoniacal copper zinc arsenate (ACZA), alkaline copper quat (ACQ-B and ACQ-D), ammoniacal copper citrate (CC), copper azole (CBA-A), copper dimethyldithiocarbamate (CDDC), borate preservatives, and oil-type wood preservatives, such as creosote, pentachlorophenol, and copper naphthenate.

Properly functioning, properly functioning condition, and properly functioning habitat condition refers to the habitat component of a species= biological requirements and means the sustained presence of natural habitat-forming processes in a watershed necessary for the long-term survival of the species through the full range of environmental variation.

Primary constituent elements (PCE) means the biological and physical features of critical habitat that are essential to the conservation of listed species.

Reasonable and prudent measures (RPM) means actions the NMFS believes necessary or appropriate to minimize the amount or extent of incidental take.

Recovery means an improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Federal Endangered Species Act.

Recreational boat dock means a structure consisting of a fixed pier, elevated walkway, ramp and float.

Recreational boat ramp means a concrete inclined plane extending from the upland into the water for use that is used to move boats to or from the water.

Riparian management area means land: (1) Within 150 feet of any natural water occupied by listed species during any part of the year or designated or proposed as critical habitat; (2) within 100 feet of any natural water within 1/4 mile upstream from areas occupied by listed species or designated as critical habitat and that is physically connected by an above-ground channel system such that water, sediment, or woody material delivered to such waters will eventually be delivered to water occupied by listed salmon or designated as critical habitat; and (3) within 50 feet of any natural water upstream from areas occupied by listed species or designated as critical habitat and that is physically connected by an above-ground channel system such that water, sediment, or woody material delivered to such waters will eventually be delivered to water occupied by listed salmon or designated as critical habitat.

Subaquatic vegetation (SAV) means any native species of aquatic plants. In estuarine areas this includes all species of eelgrass.

Saltwater area – see estuary**.**

Scope of the action means the range of actions and impacts to be considered in the analysis of effects.

Shallow water means a water column depth of less than 20 feet as measured at Ordinary Low Water or Mean Lower Low Water.

Shallow water area means the areal extent of the waterbody where the column depth is less than 20 feet as measured at Ordinary Low Water or Mean Lower Low Water.

Sound exposure level (SEL) means a measure of sound energy dose that is defined as the constant sound level acting for one second that has the same acoustic energy as the original sound (Hastings and Popper 2005). SEL is calculated by summing the cumulative pressure squared over time as decibels re 1 micropascal^2-second.

Stream-floodplain corridor means the main stream channel and its functional floodplain.

Streambank toe means the part of the streambank below ordinary high water.

Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Threatened species means a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Viable Salmonid Population means an independent population of any Pacific salmonid that has a negligible risk of extinction due to threats from demographic variation, local environmental variation and genetic changes over a 100 year time frame.

Working adequately means erosion controls that do not allow ambient stream turbidity to increase by more than 10% above background 100 feet below the discharge, when measured relative to a control point immediately upstream of the turbidity-causing activity.

LIST OF ABBREVIATIONS

BA	Biological Assessment
BMP	Best Management Practice
CFR	Code of Federal Regulations
CHART	Critical Habitat Analytical Review Team
CMZ	Channel migration zone
dB	Decibel
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FR	Federal Register
HAPC	Habitat Area of Particular Concern
HUC	Hydraulic Unit Code
LCR	Lower Columbia River
MCR	Middle Columbia River
MP	Mile Post
MSA	Magnuson Stevens Act
NMFS	National Marine Fisheries Service
OHW	Ordinary High Water
PCE	Primary constituent element
Re: 1μPa	Reference 1 MicroPascal
RM	River Mile
RMS	Root Mean Squared
RPM	Reasonable and prudent measure
SEL	Sound exposure level
SR	Snake River
SRB	Snake River Basin
TRT	Technical Review Team
UCR	Upper Columbia River
U.S.C.	United States Code
UWR	Upper Willamette River
VSP	Viable Salmonid Population
WLC	Willamette/Lower Columbia

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The programmatic biological opinion (opinion) and incidental take statement portions of this document were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.), and implementing regulations at 50 CFR 402.

The NMFS also completed an Essential Fish Habitat (EFH) consultation. It was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, *et seq*.) and implementing regulations at 50 CFR 600.

The opinion and EFH conservation recommendation are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-5444) ("Data Quality Act") and underwent pre-dissemination review.

1.2 Consultation History

On November 2, 2011, the U.S. Army Corps of Engineers, Portland (Corps), requested formal consultation on implementing its Standard Local Operating Procedures for Endangered Species (SLOPES) program as it applies to Corps activities involving in-water and over-water structures (including pile driving, access management, and minor discharges), in Oregon, and the south shore of the Columbia River and its tributaries (SLOPES IV In-water Over-water Structures or SLOPES IV).

SLOPES refers to the process and criteria that the Corps uses to guide the administration of certain activities regulated under section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act, or carried out by the Corps as part of civil works programs authorized by sections 206, 536, and 1135 of the Water Resources Development Act. Under SLOPES, applications for proposed actions that the Corps finds to be within the range of effects considered in the corresponding opinion are issued a permit with conditions. Applications found not to be within this range of effects are submitted to NMFS for additional site specific ESA and EFH consultation. A series of SLOPES programmatic opinions have been issued since March 21, 2001.

In annual monitoring reports for SLOPES, the Corps provided the number of permit requests for in- and over-water activities that were permitted under the past programmatics (Table 1). The last SLOPES opinion (SLOPES III, refer to NMFS No.: 2004/01043) covering the proposed actions expired in 2007. Table 2 provides the number since that date of individual consultations NMFS has conducted with the Corps on the types of activities that would be covered under the proposed action.

Table 1. Number of Corps permits issued within the action area by activity type under prior SLOPES opinions.

YEAR	ACTIVITY		
	In- and over-water structures	Access Management	Minor Discharges
2001 (n=55)	24	9	22
2002 (n=59)	32	11	16
2003 (n=65)	46	2	17
2004 (n=34)	6	10	18
2005 (n=27)	18	2	7
2006 (n=35)	26	4	5

Table 2. Number of individual consultations NMFS conducted with the Corps since 2006 on the types of activities proposed for coverage in the SLOPES IV In-water Over-water programmatic opinion.

YEAR	ACTIVITY		
	In- and over-water structures	Access Management	Minor Discharges
2007 (n = 27)	7	9	11
2008 (n = 30)	8	8	14
2009 (n = 43)	21	14	8
2010= (n = 55)	26	18	11
2011[1] (n = 18)	9	7	2

Experiences of the Corps and NMFS during administration and implementation of the SLOPES program, including, data collected from individual projects, and the results of the annual monitoring conference, guide the Corps and NMFS in their determination of when it is necessary to adjust actions authorized under the SLOPES opinions. These adjustments ensure that covered actions will continue to meet ESA requirements; share characteristics that produce environmental effects which are minor, repetitive, and predictable in nature; and share similar requirements for regulatory approval.

A complete record of this consultation is on file at the Oregon State Habitat Office in Portland, Oregon.

[1] Through July 2011

1.3 Proposed Action

The Corps proposes to implement its SLOPES program as it applies to Corps activities involving in-water and over-water structures (including pile driving, access management, and minor discharge) in Oregon, including the south shore of the Columbia River and its tributaries, as authorized by the Corps authority under section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act, or as carried out by the Corps as part of civil works programs authorized by sections 206, 536, and 1135 of the Water Resources Development Act. More specifically, the Corps proposes to implement its SLOPES IV in State of Oregon waters and land under the jurisdiction of the Portland District, Army Corps of Engineers – and only to the extent to which the program falls within the NMFS Northwest Region's area of responsibility.

Historical data (Table 1) show that no more than 65 actions per year have been completed under prior SLOPES Opinions. However, due to expected population growth within Oregon and maintenance of prior approved actions, NMFS assumes that the maximum number of actions authorized or carried out each year under the proposed program may increase by a factor of three, up to a total of 195 actions per year.

The Corps is proposing to use this iteration of SLOPES to authorize four categories of actions, specifically:

Install a new or expanded aid to navigation, mooring buoy, mooring dolphin, recreational boat dock, or recreational boat ramp, including all actions necessary to complete installation *e.g.*, geotechnical surveys, pile driving and minimal excavation (less than 25 cubic yards), grading, or filling. A recreational boat dock consists of a fixed pier, elevated walkway, ramp and float; and a recreational boat ramp is an inclined plane (usually of concrete) extending from the upland into the water that is used to move boats to or from the water.

This action does not include any project that would install a new mooring buoy, mooring dolphin, recreational boat dock or recreational boat ramp at a site with any of the following characteristics:

- An alcove, backwater slough, downstream of a bar or island, side channel, or any other shallow-water area (means a water column depth of less than 20 feet as measured at Ordinary Low Water (OLW) or Mean Lower Low Water (MLLW) where routine maintenance dredging will be required), flow is insufficient to dissipate fuels and other pollutants from vessels, or water depth is insufficient to prevent the structure from grounding out during normal low flow conditions.
- A Superfund Site designated by the U.S. Environmental Protection Agency, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by historical information or the Corps' best professional judgment.
- Within a Corps or NMFS compensatory mitigation site or aquatic habitat enhancement, restoration, preservation, or creation site.

Maintain, rehabilitate, replace, or remove an existing in-water or over-water structure as necessary to extend the useful service life of the structure, or to withdraw the public or private structure from service when its usefulness has ended. Eligible structures include, but are not limited to, an aid to navigation, boat house, boat launch ramp, breakwater, buoy, commercial/industrial/recreational pier or wharf, port/industrial/marina facilities,[2] covered boat house, dock, dolphin, float plane hanger, floating storage unit, floating walkway, groin, jetty, marina, mooring structure, permanently moored floating vessel, private boat dock, recreational boat ramp, or wharf.

This does not include any action that would occur in a Superfund Site designated by the U.S. Environmental Protection Agency, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by historical information or the Corps' best professional judgment.

Dredging to maintain vessel access to previously authorized docks, wharfs, mooring structures, and boat ramps by maintaining an existing dredge prism, provided that any dredged materials and subsequent leave surface are suitable and approved for in-water disposal. Where appropriate, this includes maintenance and advanced maintenance to ensure that vessel access is not interrupted by normal changes in river conditions during a reasonable interval between dredging events. This action does not include any modification that changes the character, scope, size, or location of the project area or previously authorized dredge prism.

This does not include any action that is part of the Corps' navigation program to maintain Federal navigation channels, or that would occur in a Superfund Site designated by the U.S. Environmental Protection Agency, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by historical information or the Corps' best professional judgment.

Dredging to maintain functionality of previously authorized channels, culverts, water intakes, or outfalls, provided that (a) the volume of material moved is limited to the minimum amount necessary to restore existing use, and all naturally-occurring sediment and debris, including large wood, are side cast or returned to the channel downstream from the structure where it will continue to provide aquatic habitat function, (b) fish passage at the structure will be maintained, and meet NMFS passage criteria.

This does not include any action that would (a) result in a discharge or excavation that exceeds 25 cubic yards; and/or 0.1 acres (b) include any water intake or point of diversion that does not have a fish screen that is installed, operated and maintained according to NMFS fish screen criteria (2008 or current version) and meet NMFS fish passage criteria; or (c) occur in a Superfund Site designated by the U.S. Environmental Protection Agency, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by historical information or the Corps' best professional judgment.

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[2] This includes replacing existing pilings, fender piles, group pilings, walers, and fender pads. It also includes the installation of new mooring dolphins and structural pilings, height extension of existing pilings and the relocation of floats within an existing marina.

1.3.1. Proposed Design Criteria

The Corps proposes to apply the following design criteria, in relevant part, to every action authorized or carried out under the program and approved under this opinion. Measures described under "Administration" apply to the Corps as it manages the SLOPES program. Measures described under "General Construction" apply, in relevant part, to each action that involves a construction component. Measures described under "Types of Actions" apply, in relevant part, to each action as described.

1.3.1.1 Administration

1. **Confirm ESA-listed species.** The Corps will confirm that the effects of each action authorized or carried out under this opinion will occur within the present or historic range of an ESA-listed salmon, steelhead, southern distinct population segment (DPS) of green sturgeon, the southern DPS of eulachon (referred to hereafter as eulachon), or Steller sea lion, or designated or proposed critical habitat, or designated EFH.
2. **Corps review.** The Corps will individually review and approve each action to ensure that (a) it meets all applicable design criteria, (b) all adverse effects to listed fish and their designated critical habitats are within the range of effects considered in this opinion; and (c) the action will not occur in a Superfund Site designated by the U.S. Environmental Protection Agency, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by historical information or the Corps' best professional judgment.
3. **NMFS review.** The Corps will ensure that all actions will also be individually reviewed and approved by NMFS as consistent with this opinion before the action is authorized. The Corps will initiate NMFS' review by submitting the action notification form (Appendix A) to NMFS with sufficient detail about the action design and construction to ensure the proposed action is consistent with all provisions of this opinion. NMFS will notify the Corps within 30 calendar days if the action is approved or disqualified.
4. **Full implementation required.** For regulatory projects, the Corps must include each applicable design criterion as an enforceable part of the permit document. For the projects carried out by the Corps, the Corps must include each applicable design criterion as a final project specification. Failure to comply with all applicable design criteria may invalidate protective coverage of ESA section 7(o)(2) regarding "take" of listed species, and may lead NMFS to a different conclusion regarding the effects of a specific project.
5. **Site access.** The Corps will retain the right of reasonable access to the site of actions authorized under this opinion to monitor the use and effectiveness of permit conditions.
6. **Salvage notice.** The Corps will include the following notice as part of each permit issued using this opinion and, for actions completed by the Corps, provide the notice in writing to the action supervisor.

   > If a sick, injured or dead specimen of a threatened or endangered species is found during construction and within the action area, the finder must notify NMFS' Office of Law Enforcement at 503-231-6240 or 206-526-6133. The finder must take care in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility for carrying out instructions provided by the Office of Law

Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

7. **Action completion report.** The Corps will submit an action completion report (Appendix B) for each action carried out by the Corps, and require the applicant to submit an action completion report for each action authorized by the Corps, to NMFS within 60 days of completing all work below ordinary high water. A completed fish salvage reporting form (Appendix C) is also required for any action that involves fish capture and removal.
8. **Site restoration or compensatory mitigation report.** The Corps will submit a site restoration or compensatory mitigation report (Appendix D) for each project carried out by the Corps, and require the applicant to submit a report for each such action authorized by the Corps, to NMFS by December 31 of the year that the Corps approves that the site restoration or compensatory mitigation is complete.
9. **Annual program report.** The Corps' Regulatory and Civil Works Branches will each submit an annual report to NMFS by February 15 of the subsequent calendar year that describes the Corps' implementation of SLOPES IV program under the terms of this opinion, and includes the following information:
    a. An assessment of overall program activity.
    b. A map showing the location and type of each action authorized and carried out under this opinion.
    c. A list of any projects for which the Corps has approved site restoration or compensatory mitigation is complete.
    d. Any other data or analyses the Corps deems necessary or helpful to assess habitat trends because of actions authorized under this opinion.
10. **Annual coordination meeting.** The Corps' Regulatory and Civil Works Branches will convene an annual coordination meeting with NMFS by March 31 each year to discuss the annual monitoring report and any actions that will improve conservation under this opinion, or make the program more efficient or more accountable.

1.3.1.2 General Construction

11. **Pollution and erosion control.** Any action that will require earthwork and may increase soil erosion and cause runoff with visible sediment into surface water, or that will require the use of materials that are hazardous or toxic to aquatic life (such as motor fuel, oil, or drilling fluid), must have a pollution and erosion control plan that is developed and carried out by the applicant, and commensurate with the scale of the action.
    a. The plan must include practices to minimize erosion and sedimentation associated with all aspects of the project (*e.g.*, staging areas, stockpiles, grading); to prevent construction debris from dropping or otherwise entering any stream or waterbody; and to prevent and control hazardous material spills.
    b. During construction, erosion controls and streams must be monitored and maintained daily during the rainy season and weekly during the dry season as necessary to ensure controls are properly functioning.
    c. If monitoring shows that the erosion controls are ineffective at preventing visible sediment discharge, the project must stop to evaluate erosion control measures.

Repairs, replacements or the installation of additional erosion control measures must be completed before the project resumes.

d. Proper maintenance includes removal of sediment and debris from erosion controls like silt fences or hay bales once it has reached on-third of the exposed height of the control.

12. **Stormwater management.** Any action that will expand, recondition, reconstruct, or replace pavement, replace a stream crossing, otherwise increase the contributing impervious surface within the project area, or create a new stormwater conveyance or discharge facility, must have a stormwater management plan that is developed and carried out by the applicant, commensurate with the scale of the action, and approved by NMFS. The stormwater plan submitted for approval must include all of the information called for by the "Checklist for Submission of a Stormwater Plan" (ODEQ 2008, or most recent version), or an explanation of why any missing information is not applicable to a specific project.

13. **Site restoration.** Any action that results in significant disturbance of riparian vegetation, soils, streambanks, or stream channel must have a site restoration plan that is developed and carried out by the permittee (or Corps), that is commensurate with the scale of the action. The goal of the plan is to ensure that riparian vegetation, soils, streambanks, and stream channel are cleaned up and restored after the action is complete. No single criterion is sufficient to measure restoration success, but the intent is that the following features should be present in the upland parts of the project area, within reasonable limits of natural and management variation:

    a. Human and livestock disturbance, if any, are confined to small areas necessary for access or other special management situations.
    b. Areas with signs of significant past erosion are completely stabilized and healed, bare soil spaces are small and well-dispersed.
    c. Soil movement, such as active rills and soil deposition around plants or in small basins, is absent or slight and local.
    d. Native woody and herbaceous vegetation, and germination microsites, are present and well distributed across the site.
    e. Plants are native species and have normal, vigorous growth form, and a high probability of remaining vigorous, healthy and dominant over undesired competing vegetation.
    f. Vegetation structure is resulting in rooting throughout the available soil profile.
    g. Plant litter is well distributed and effective in protecting the soil with little or no litter accumulated against vegetation as a result of active sheet erosion ("litter dams").
    h. A continuous corridor of shrubs and trees appropriate to the site are present to provide shade and other habitat functions for the entire streambank.
    i. Streambanks are stable, well vegetated, and protected at margins by roots that extend below baseflow elevation, or by coarse-grained alluvial debris.

14. **Compensatory mitigation.** Any action that will permanently displace riparian or aquatic habitats or otherwise prevent development of properly functioning condition of natural habitat processes will require compensatory mitigation to fully offset those impacts.

    a. Examples of actions requiring compensatory mitigation include construction of a new or enlarged boat ramp or float, the addition of scour protection to a boat ramp, or construction of new impervious surfaces without adequate stormwater treatment.

   b. For displaced riparian and aquatic habitat, the primary habitat functions of concern are related to the physical and biological features essential to the long-term conservation of listed species. Those are water quality, water quantity, channel substrate, floodplain connectivity, forage, natural cover, space, and free passage. Examples of acceptable mitigation for riparian losses includes planting trees or other woody vegetation in the riparian area, removal of existing overwater structures or restoration of shallow-water, off-channel, or beach habitat by adding features such as submerged or overhanging large wood, aquatic vegetation, large rocks and boulders, side channels and undercut banks.
   c. For new impervious surfaces with inadequate stormwater treatment, the primary habitat functions of concern are water quality and water quantity. Examples of acceptable mitigation for inadequate stormwater management includes providing adequate stormwater treatment at an alternate site where it did not exist before or retrofitting an existing but substandard stormwater facility to provide capacity necessary to infiltrate and retain the proper volume of stormwater.
   d. As part of NMFS's review under clause 3 above, NMFS will determine if the proposed compensatory mitigation fully offsets permanent displacement of riparian or aquatic habitats and/or impacts that prevent development of properly functioning processes.

15. Preconstruction activity. Before alteration of the action area, flag the boundaries of clearing limits associated with site access and construction to minimize soil and vegetation disturbance, and ensure that all temporary erosion controls are in place and functional.

16. Site preparation. During site preparation, conserve native materials for restoration, including large wood, vegetation, topsoil and channel materials (gravel, cobble and boulders) displaced by construction. Whenever practical, leave native materials where they are found and in areas to be cleared, clip vegetation at ground level to retain root mass and encourage reestablishment of native vegetation. Building and related structures may not be constructed inside the riparian management area.

17. Heavy equipment. Heavy equipment will be selected and operated as necessary to minimize adverse effects on the environment (*e.g.*, minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils); and all vehicles and other heavy equipment will be used as follows:

   a. Stored, fueled and maintained in a vehicle staging area placed 150 feet or more from any waterbody, or in an isolated hard zone such as a paved parking lot.
   b. Inspected daily for fluid leaks before leaving the vehicle staging area for operation within 50 feet of any waterbody.
   c. Steam-cleaned before operation below ordinary high water, and as often as necessary during operation to remain free of all external oil, grease, mud, seeds, organisms and other visible contaminants.
   d. Generators, cranes and any other stationary equipment operated within 150 feet of any waterbody will be maintained and protected as necessary to prevent leaks and spills from entering the water.

18. **<u>In-water work period</u>.** All work within the active channel will be completed in accordance with the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife resources (ODFW 2000, or the most recent version), except as follows:
    a. All in-water work in the Willamette River mainstem between Willamette Falls and the confluence with the Columbia River must be completed between July 1 and October 31.
    b. All in-water work in the Columbia River mainstem below Bonneville Dam, except pile driving, must be completed between November 1 and December 31.
    c. Pile driving in the Columbia River mainstem below Bonneville Dam must be completed between October 1 and November 31.
    d. Hydraulic and topographic measurements and encased geotechnical drilling may be completed at any time, if a fish biologist determines that no adult fish are congregating for spawning and no redds are occupied by eggs or pre-emergent alevins within 300 feet of the work site.
19. **<u>Actions that require work area isolation</u>.** Any action that involves excavation (other than access management), backfilling, embankment construction, or similar work below ordinary high water where adult or juvenile fish are reasonably certain to be present, or 300 feet or less upstream from spawning habitats, must be effectively isolated from the active stream.
20. **<u>Fish capture and removal</u>.** Whenever work isolation is required and ESA-listed fish are likely to be present, the applicant must attempt to capture and remove the fish as follows:
    a. A fishery biologist experienced with work area isolation and competent to ensure the safe capture, handling and release of all fish will supervise this part of the action, and complete the fish salvage form from Appendix C that will be submitted with the action completion report.
    b. Any fish trapped within the isolated work area must be captured and released using a trap, seine, electrofishing, or other methods as prudent to minimize the risk of injury, then released at a safe release site.
    c. If electrofishing is used to capture fish, that work must consistent with NMFS' electrofishing guidelines (NMFS 2000).
21. **<u>Piling installation</u>.** Pilings may be concrete, steel round pile 24 inches in diameter or smaller, steel H-pile designated as HP24 or smaller, or wood that has not been treated with preservatives or pesticides. Any proposal to use wood pilings treated with preservatives or pesticides is not covered by this consultation and will require individual consultation.
    a. When practical, use a vibratory hammer for piling installation. For pile driving in the Columbia River in the month of October, only a vibratory hammer may be used.
    b. Jetting may be used for piling installation in areas with coarse, uncontaminated sediments.
22. **<u>Pile driving with an impact hammer</u>.** When using an impact hammer to drive or proof steel piles, one of the following sound attenuation methods must be used:
    a. Completely isolate the pile from flowing water by dewatering the area around the pile.
    b. If water velocity is 1.6 feet per second or less, surround the piling being driven by a confined or unconfined bubble curtain (see NMFS and USFWS 2006, Wursig *et al*. 2000, and Longmuir and Lively 2001) that will distribute small air bubbles around 100% of the piling perimeter for the full depth of the water column.

c. If water velocity is greater than 1.6 feet per second, surround the piling being driven by a confined bubble curtain (*e.g.*, a bubble ring surrounded by a fabric or non-metallic sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.

23. Pile driving where Steller sea lions may be present. If the action area is between Bonneville Dam and the mouth of the Columbia River, or outside of the Columbia River but within 10-miles of a Steller sea lion haul-out[3], the following conditions apply:

a. A biologist qualified in marine mammal identification will be on site during all pile driving and will notify the operator to cease operations if a Steller sea lion enters the 1,200 foot radius of the pile.
b. Pile driving may not begin if Steller sea lions are within 1,200 feet of the pile being driven.
c. Pile driving must cease if Steller sea lions approach to within 1,200 feet of the pile being driven.

24. Pile removal. Use the following steps to minimize creosote release, sediment disturbance and sediment resuspension:

a. Install a floating surface boom to capture floating surface debris.
b. Keep all equipment (*e.g.*, bucket, steel cable, vibratory hammer) out of the water, grip piles above the waterline, and complete all work during low water and low current conditions.
c. Dislodge the piling with a vibratory hammer, when possible; never intentionally break a pile by twisting or bending.
d. Slowly lift the pile from the sediment and through the water column.
e. Place the pile in a containment basin on a barge deck, pier, or shoreline without attempting to clean or remove any adhering sediment – a containment basin for the removed piles and any adhering sediment may be constructed of durable plastic sheeting with sidewalls supported by hay bales or another support structure to contain all sediment and return flow which may otherwise be directed back to the waterway.
f. Fill the holes left by each piling with clean, native sediments immediately upon removal.
g. Dispose of all removed piles, floating surface debris, any sediment spilled on work surfaces, and all containment supplies at a permitted upland disposal site.

25. Broken or intractable piling. When a pile breaks or is intractable during removal, continue removal as follows:

a. Make every attempt short of excavation to remove each piling, if a pile in uncontaminated sediment is intractable, breaks above the surface, or breaks below the surface, cut the pile or stump off at least 3 feet below the surface of the sediment.
b. If dredging is likely where broken piles are buried, use a global positioning system (GPS) device to note the location of all broken piles for future use in site debris characterization.

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[3] Haul outs are located at 3 Arches Rock, Orford Reef, Rogue Reef, Sea Lion Caves, Cape Arago State Park, Oregon Islands National Wildlife Refuge and South Jetty Columbia River

26. **Pesticide-treated wood installation.**[4] Use of lumber, pilings, or other wood products treated or preserved with pesticidal compounds may not be used below ordinary high water, or as part of an in-water or overwater structure
27. **Pesticide-treated wood removal.** When it is necessary to remove pesticide-treated wood, the following conditions apply.
    a. Ensure that, to the extent possible, no wood debris falls into the water. If wood debris does fall into the water, remove it immediately.
    b. After removal, place wood debris in an appropriate dry storage site until it can be removed from the project area.
    c. Do not leave wood construction debris in the water or stacked on the streambank at or below the ordinary high water.
    d. Evaluate wood construction debris removed during a project, including pesticide-treated wood pilings, to ensure proper disposal of debris.

1.3.1.3 Types of Actions

In-water or Over-water Structures

28. **Boat ramps.** All boat ramps must consist of pre-cast concrete slabs below ordinary high water, and may be cast-in-place above ordinary high water if completed in the dry. Rock may be used to prevent scouring, down-cutting, or failure at the boat ramp, provided that the rock is no larger than necessary and does not extend further than 4-feet from the edge of the ramp in any direction.
29. **Educational signs.** To educate the public about pollution from boating activities and its prevention, the Corps shall install (Corps project) or require the following information or its equivalent to be posted on a permanent sign that will be maintained at each permitted facility that is used by the public (*e.g.,* a public boat ramp or marina):
    a. A description of the ESA-listed species which are or may be present in the project area.
    b. Notice that adults and juveniles of these species are protected by the ESA and other laws so that they can successfully migrate, spawn, rear, and complete other behaviors necessary for their recovery.
    c. Therefore, all users of the facility are encouraged or required to: (i) Follow procedures and rules governing use of sewage pump-out facilities; (ii) minimize the fuel and oil released into surface waters during fueling, and from bilges and

[4] For alternatives sources of structural lumber and pilings designed for industrial and marine applications, but not based on pesticide-treated wood, including silica-based wood preservation, improved recycled plastic technology, and environmentally safe wood sealer and stains, see, *e.g.,* Resco Plastics (Coos Bay, Oregon; ph. 541.269.5485) and American Plastic Lumber (Shingle Springs, California; ph. 530.677.7700) for lumber from recycled plastic; Plastic Pilings, Inc. (Rialto, California; ph. 909.874.4080) for structural and non-structural lumber from recycled plastic; Timbersil (Placentia, California; ph. 714.223.1804) for outdoor lumber treated with silica; Kebony (ph. 888.914.9995) for outdoor lumber impregnated with a resin from furfuryl alcohol, a byproduct of sugar production; and Timber Pro Coatings (Portland, Oregon; ph. 503.232.1705) for a silica-based internal wood stabilizer, and a low-VOC wood sealer/stain. The use of trade, firm, or corporation names in this Opinion is for the information and convenience of the action agencies, and does not constitute an official endorsement or approval by the U.S. Department of Commerce or NMFS of any product or service to the exclusion of others that may be suitable.

gas tanks; (iii) avoid cleaning boat hulls in the water to prevent the release of cleaner, paint and solvent; (iv) practice sound fish cleaning and waste management, including proper disposal of fish waste; and (v) dispose of all solid and liquid waste produced while boating in a proper facility away from surface waters.

30. **Flotation material.** All synthetic flotation material must be permanently encapsulated to prevent breakup into small pieces and dispersal in water.
31. **New or replacement floats.** Any new or replacement float must be placed at least 50 feet from the shoreline (100-feet from the shoreline in the Columbia River) as measured at ordinary low water or mean lower low water and may not be placed in an estuarine area with submerged aquatic vegetation. Any float wider than 6-feet must also include (a) an open area of grating that is at least 50% of the total surface area,; or (b) be placed where current velocity is at least 0.7 feet per second year-round. Floats may not exceed 10' in width or 40' in length or a total of 400 square feet.
32. **Piscivorous birds.** All float pilings, mooring buoys, and navigational aids must be fitted with devices to prevent perching by piscivorous birds.
33. **Relocation of existing structures in a marina.** Any existing structure that is relocated in a marina must remain within the existing overall footprint, but no closer than 50 feet of the shoreline (100 feet in the Columbia River) as measured at ordinary low water or mean lower low water.
34. **Repair or replacement of wall and roof components for a covered moorage or boat house.** Any replacement for a roof, wall, or garage door of a covered moorage or boat house must be made of translucent materials or incorporate skylights to allow light penetration.

Dredging

35. **Dredging to Maintain Vessel Access.** When dredging to maintain access to previously authorized docks, wharfs, mooring structures, and boat ramps, the following conditions apply:
    a. All dredged materials and subsequent leave surface must be suitable and approved for in-water disposal using newly acquired or historical data based on criteria in the Sediment Evaluation Framework ((USACE *et al.* 2009).
    b. All dredged sediment and debris must be side cast or returned to the channel within the ordinary high-water line downstream from the dredging site where it will be recruited by the next annual high flow and continue to provide aquatic habitat functions.
    c. The dredging must not alter the character, scope, size, or location of the project area or previously authorized dredge prism.

36. **Dredging to Maintain Functionality.** When discharging or excavating to maintain the functionality of a channel, culvert, intake, or outfall, the following conditions apply:
    a. Either the discharge or excavation may not exceed 25 cubic yards, or include any water intake or point of diversion that does not have a fish screen that is installed, operated and maintained according to NMFS fish screen criteria and meet NMFS fish passage criteria.

b. All dredged materials and subsequent leave surface must be suitable and approved for in-water disposal using newly acquired or historical data based on criteria in the Sediment Evaluation Framework.
c. All dredged sediment and debris must be side cast or returned within the annual high flow channel downstream from the dredging site where it will continue to provide aquatic habitat functions.
d. The dredging must not alter the character, scope, size, or location of the project area.

1.3.2. Interrelated and Interdependent Actions

To the extent that the proposed action will result in the construction of new in-water or over-water structures, the operation and maintenance of those structures as necessary to extend their useful service life, or to withdraw those structures from service when their usefulness has ended, are included here as interrelated and interdependent actions whose effects will be considered in the following analysis. Similarly, to the extent that the proposed action will result in the maintenance or replacement of a preexisting structure, the continued operation and maintenance of those structures, and the use of these structures to support boating activities are also included here as interrelated and interdependent actions and those effects will also be considered in the following analysis.

NMFS relied on the foregoing description of the proposed action, including all stated project design criteria, in conducting this consultation. The realities of completing actions proposed, funded or authorized by action agencies often require changes in design, practices, or methods during implementation. Such changes can bear on the environmental effects of an action, and thus could affect the validity of the conclusion made during consultation, and/or the validity of the Incidental Take Statement. Therefore, the Corps should keep NMFS informed of any such changes.

1.4 Action Area

The action area consists of all the areas where the environmental effects of actions authorized under SLOPES IV program may occur. SLOPES IV projects can be authorized, and will have environmental effects, on State of Oregon waters and land under the jurisdiction of the Portland District, Army Corps of Engineers that are within the NMFS Northwest Region's area of responsibility. There is overlap between the areas impacted by the SLOPES IV program and the range of ESA listed salmon, steelhead, southern DPS green sturgeon, southern DPS eulachon, eastern DPS Steller sea lion, or designated critical habitat. Eighteen ESA-listed species and 16 designated critical habitats occur in the action area and were considered in this opinion (Table 3).

The waters that form the Klamath River system do not fall within the action area because the Klamath basin is not within the NMFS Northwest Region's area of responsibility and thus no SLOPES IV projects will be authorized within that basin (nor will SLOPES IV projects authorized in other areas have effects in that basin).

The action area is also designated as EFH for Pacific Coast groundfish (PFMC 2006), coastal pelagic species (PFMC 1998), and Pacific Coast salmon (PFMC 1999), or is in an area where environmental effects of the proposed action may adversely affect designated EFH for those species.

Table 3. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: "T" means listed as threatened under the ESA; "E" means listed as endangered; "P" means proposed.

Species	Listing Status	Critical Habitat	Protective Regulations
Marine and Anadromous Fish			
Chinook salmon (*Oncorhynchus tshawytscha*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River spring/summer run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Chum salmon *(O. keta)*			
Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	Not applicable	6/28/05; 70 FR 37160
Oregon Coast	T 2/11/08; 73 FR 7816	2/11/08; 73 FR 7816	2/11/08; 73 FR 7816
Southern Oregon / Northern California Coasts	T 6/28/05; 70 FR 37160	5/5/99; 64 FR 24049	6/28/05; 70 FR 37160
Sockeye salmon (*O. nerka*)			
Snake River	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Lower Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 8/24/09; 74 FR 42605	9/02/05; 70 FR 52630	2/01/06; 71 FR 5178
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Green sturgeon (*Acipenser medirostris*)			
Southern DPS	T 4/07/06; 71 FR 17757	10/09/09; 74 FR 52300	6/02/10; 75 FR 30714
Eulachon (*Thaleichthys pacificus*)			
Southern DPS	T 3/18/10; 75 FR 13012	10/20/11; 76 FR 65324	Not applicable
Marine Mammals			
Steller sea lion (*Eumetopias jubatus*)			
Eastern DPS	T 5/5/1997; 63 FR 24345	8/ 27/93; 58 FR 45269	11/26/90; 55 FR 49204

2. ENDANGERED SPECIES ACT BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the U.S. Fish and Wildlife Service, NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Section 7(b)(3) requires that at the conclusion of consultation, the Service provide an opinion stating how the agencies' actions will affect listed species or their critical habitat. If incidental take is expected, Section 7(b)(4) requires the provision of an incidental take statement (ITS) specifying the impact of any incidental taking, and including reasonable and prudent measures to minimize such impacts.

2.1 Introduction to the Biological Opinion

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

This opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat (Hogarth 2005).

We will use the following approach to determine whether the proposed action described in Section 1.3 is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- *Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action*. This section describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. For listed salmon and steelhead, NMFS has developed specific guidance for analyzing the status of the listed species' component populations in a "viable salmonid populations" paper (VSP; McElhany *et al*. 2000). The VSP approach considers the abundance, productivity, spatial structure, and diversity of each population as part of the overall review of a species' status. For listed salmon and steelhead, the VSP criteria therefore encompass the species' "reproduction, numbers, or distribution" (50 CFR 402.02). In describing the range-wide status of listed species, we rely on viability assessments and criteria in technical recovery team documents and recovery plans, where available, that describe how VSP criteria are applied to specific populations, major population groups, and species. We determine the rangewide status of critical habitat by examining the condition of its physical or biological features (also called "primary constituent elements" or PCEs in some designations) – which were identified when the critical habitat was designated. Species and critical habitat status are discussed in Section 2.2.

- *Describe the environmental baseline for the proposed action*. The environmental baseline includes the past and present impacts of Federal, state, or private actions and other human activities *in the action area*. It includes the anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 2.3 of this opinion.
- *Analyze the effects of the proposed actions*. In this step, NMFS considers how the proposed action would affect the species' reproduction, numbers, and distribution or, in the case of salmon and steelhead, their VSP characteristics. NMFS also evaluates the proposed action's effects on critical habitat features. The effects of the action are described in Section 2.4 of this opinion.
- *Describe any cumulative effects.* Cumulative effects, as defined in NMFS' implementing regulations (50 CFR 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 2.5 of this opinion.
- *Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.* In this step, NMFS adds the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2). Integration and synthesis occurs in Section 2.6 of this opinion.
- *Reach jeopardy and adverse modification conclusions*. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 2.7. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section (2.6).
- *If necessary, define a reasonable and prudent alternative to the proposed action.* If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action. The RPA must not be likely to jeopardize the continued existence of ESA-listed species nor adversely modify their designated critical habitat and it must meet other regulatory requirements.

In this opinion, NMFS concludes that the proposed action is not likely to adversely affect (NLAA) the Eastern DPS of Steller sea lions. See Section 2.11 for details.

2.2 Rangewide Status of the Species and Critical Habitat

The summaries that follow describe the status of the 18 ESA-listed species, and their designated critical habitats, that occur within the geographic area of this proposed action and are considered in this opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register (Table 3).

Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring will be less affected. Low-elevation areas are likely to be more affected.

During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas (USGCRP 2009). Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F (USGCRP 2009). Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during summer months, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff so stream flows in late spring, summer, and fall will be lower and water temperatures will be warmer (ISAB 2007, USGCRP 2009).

Higher winter stream flows increase the risk that winter floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (USGCRP 2009). Earlier peak stream flows will also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation (USGCRP 2009). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al*. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005, Zabel *et al*. 2006, USGCRP 2009). Ocean conditions adverse to salmon and steelhead may be more likely under a warming climate (Zabel *et al*. 2006).

Although southern green sturgeon and eulachon and are not part of this recovery domain structure, they are presented here for convenience as part of the Willamette/Lower Columbia Recovery Domain.

2.2.1 Status of the Species

The status of steelhead and salmon species and critical habitat sections below are organized under five recovery domains (Table 4) to better integrate recovery planning information that NMFS is developing on the conservation status of the species and critical habitats considered in this consultation. Recovery domains are the geographically-based areas that NMFS is using to prepare multi-species recovery plans. Southern DPS green sturgeon are under the jurisdiction of NMFS' Southwest Region. The first meeting of the recovery team for this species was announced to be held in December 2009. A recovery team has not yet been convened for eulachon, a species under the jurisdiction of NMFS' Northwest Region.

Table 4. Recovery planning domains identified by NMFS and their ESA-listed salmon and steelhead species.

Recovery Domain	Species
Willamette-Lower Columbia	LCR Chinook salmon UWR Chinook salmon CR chum salmon LCR coho salmon LCR steelhead UWR steelhead
Interior Columbia	UCR spring-run Chinook salmon SR spring/summer Chinook salmon SR fall-run Chinook salmon LO sockeye salmon SR sockeye salmon UCR steelhead MCR steelhead SRB steelhead
Oregon Coast	OC coho salmon
Southern Oregon/Northern California Coasts	SONCC coho salmon

For each recovery domain, a technical review team (TRT) appointed by NMFS has developed, or is developing, criteria necessary to identify independent populations within each species, recommended viability criteria for those species, and descriptions of factors that limit species survival. Viability criteria are prescriptions of the biological conditions for populations, biogeographic strata, and ESUs that, if met, would indicate that the ESU will have a negligible risk of extinction over a 100-year time frame.

The definition of a population used by each TRT to analyze salmon and steelhead is set forth in the "viable salmonid population" document prepared by NMFS for use in conservation assessments of Pacific salmon and steelhead (McElhany *et al*. 2000). That document defines population viability in terms of four variables: abundance, population growth rate (productivity), population spatial structure, and genetic diversity.

Abundance is of obvious importance since, in general, small populations are at greater risk of extinction than large populations, primarily because many processes that affect population dynamics may operate differently in small populations than in large populations (Shaffer 1987, McElhany *et al.* 2000).

Population growth rate, the productivity over the entire life cycle, and factors that affect population growth rate provide information about how well a population is performing in the various habitats it occupies during the life cycle. Examining population growth rate allows one to assess if populations are able to replace themselves. Populations that consistently fail to replace themselves are at greater risk of extinction than populations that are consistently at or above replacement levels.

Spatial structure refers to the distribution of individuals within a population at a certain life stage throughout the available habitats, recognizing the abiotic and biotic processes that give rise to that structure. McElhany *et al.* (2000) gave two main reasons why spatial structure is important to consider when evaluating population viability: (1) Overall extinction risk at longer time scales may be affected in ways not apparent from short-term observations of abundance and productivity, because there can be a time lag between changes in spatial structure and the resulting population-level effects; and (2) spatial population structure affects the ability of a population to respond to changing environmental conditions and therefore can influence evolutionary processes. Maintaining spatial structure within a population, and its associated benefits to viability, requires appropriate habitat conditions and suitable corridors linking the habitat and the marine environment to be consistently available.

Diversity relates to the variability of phenotypic characteristics such as life histories, individual size, fecundity, run timing, and other attributes exhibited by individuals and populations, as well as the genetic diversity that may underlie this variation. There are many reasons diversity is important in a spatially and temporally varying environment. Three key reasons are: (1) Diversity allows a species to use a wide array of environments; (2) diversity protects a species against short-term spatial and temporal changes in the environment; and (3) genetic diversity provides the raw material for surviving long-term environmental change (McElhany *et al.* 2000).

Although the TRTs operated from this common set of biological principals described in McElhany *et al.* (2000), they worked semi-independently from each other and developed criteria suitable to the species and conditions found in their specific recovery domains. All of the criteria have qualitative as well as quantitative aspects. The diversity of salmonid species and populations makes it impossible to set narrow quantitative guidelines that will fit all populations in all situations. For this and other reasons, viability criteria vary among species, mainly in the number and type of metrics and the scales at which the metrics apply (*i.e.*, population, major population group [MPG], or ESU) (Busch *et al.* 2008). \

Overall viability risk scores (high to low) are based on combined ratings for the abundance and productivity (A/P) and spatial structure and diversity[5] (SS/D) metrics (Table 5). The A/P score considers the TRT's estimate of a populations' minimum threshold population, natural spawning abundance and the productivity of the population. Productivity over the entire life cycle and factors that affect population growth rate provide information on how well a population is "performing" in the habitats it occupies during the life cycle. Estimates of population growth rate that indicate a population is consistently failing to replace itself are an indicator of increased extinction risk. The four metrics (abundance, productivity, spatial structure, and diversity) are not independent of one another and their relationship to sustainability depends on a variety of interdependent ecological processes (Wainwright *et al.* 2008).

Integrated SS/D risk combines risk for likely, future environmental conditions, and diversity (McElhany *et al.* 2000, McElhany *et al.* 2007, Ford *et al.* 2010). Diversity factors include:

- Life history traits: Distribution of major life history strategies within a population, variability of traits, mean value of traits, and loss of traits.
- Effective population size: One of the indirect measures of diversity is effective population size. A population at chronic low abundance or experiencing even a single episode of low abundance can be at higher extinction risk because of loss of genetic variability, inbreeding and the expression of inbreeding depression, or the effects of mutation accumulation.
- Impact of hatchery fish: Interbreeding of wild populations and hatchery origin fish can be a significant risk factor to the diversity of wild populations if the proportion of hatchery fish in the spawning population is high and their genetic similarity to the wild population is low.
- Anthropogenic mortality: The susceptibility to mortality from harvest or habitat alterations will differ depending on size, age, run timing, disease resistance or other traits.
- Habitat diversity: Habitat characteristics have clear selective effects on populations, and changes in habitat characteristics are likely to eventually lead to genetic changes through selection for locally adapted traits. In assessing risk associated with altered habitat diversity, historical diversity is used as a reference point.

[5] The WLC-TRT provided ratings for diversity and spatial structure risks. The IC-TRT provided spatial structure and diversity ratings combined as an integrated SS/D risk.

Table 5. Population persistence categories from McElhany *et al.* (2006). A low or negligible risk of extinction is considered "viable" (Ford *et al.* 2010). Population persistence categories correspond to: 4 = very low (VL), 3 = low (L), 2 = moderate (M), 1 = high (H), and 0 = very high (VH) in Oregon populations, which corresponds to "extirpated or nearly so" (E) in Washington populations (Ford *et al.* 2010).

Population Persistence Category	Probability of population persistence in 100 years	Probability of population extinction in 100 years	Description
0	0-40%	60-100%	Either extinct or "high" risk of extinction
1	40-75%	25-60%	Relatively "high" risk of extinction in 100 years
2	75-95%	5-25%	"Moderate" risk of extinction in 100 years
3	95-99%	1-5%	"Low" (negligible) risk of extinction in 100 years
4	>99%	<1%	"Very low" risk of extinction in 100 years

The boundaries of each population are defined using a combination of genetic information, geography, life-history traits, morphological traits, and population dynamics that indicate the extent of reproductive isolation among spawning groups. To date, the TRT have divided the species of salmon and steelhead considered in this opinion into a total of 304 populations, although the population structure of PS steelhead has yet to be resolved. The overall viability of a species is a function of the VSP attributes of its constituent populations. Until a viability analysis of a species is completed, the VSP guidelines recommend that all populations should be managed to retain the potential to achieve viable status to ensure a rapid start along the road to recovery, and that no significant parts of the species are lost before a full recovery plan is implemented (McElhany *et al.* 2000).

Climate change, as described in Section 2.2, is likely to adversely affect the size and distribution of populations of ESA-listed anadromous fish in the Pacific Northwest. The size and distribution of the populations considered in this opinion generally have declined over the past few decades due to natural phenomena and human activity, including the operation of hydropower systems, over-harvest, hatcheries, and habitat degradation. Enlarged populations of terns, seals, sea lions, and other aquatic predators in the Pacific Northwest have been identified as factors that may be limiting the productivity of some Pacific salmon and steelhead populations (Ford *et al.* 2010).

Southern DPS green sturgeon occur in all four coastal recovery domains, although they are only known to spawn in the Sacramento River system. Therefore, only subadults and adults may be present in recovery domains north of San Francisco Bay. Eulachon also occur in all coastal recovery domains. However, the status of these species will only be presented once, with information presented for the Willamette and Lower Columbia (WLC) recovery domain. Each species consist of a single population.

Viability status is described below for each of the populations considered in this opinion.

Willamette and Lower Columbia Recovery Domain. Species in the WLC recovery domain include LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, UWR steelhead, southern green sturgeon, and eulachon. The WLC-TRT has identified 107 demographically independent populations of Pacific salmon and steelhead (Table 6). These populations were further aggregated into strata, groupings above the population level that are connected by some degree of migration, based on ecological subregions. All 107 populations use parts of the mainstem of the Columbia River and the Columbia River estuary for migration, rearing, and smoltification.

On August 15, 2011, NMFS announced the results of an ESA 5-year review for salmon and steelhead in the WLC Recovery Domain (76 FR 50448). After reviewing new information on the viability of these species, ESA section 4 listing factors, and efforts being made to protect the species, NMFS concluded that all six species in this domain should retain their 2005 (for salmon) or 2006 (for steelhead) listing classifications.

Table 6. Populations in the WLC recovery domain. Combined extinction risks for salmon and steelhead based on analysis of Oregon populations only.

Species	Populations
LCR Chinook salmon	32
UWR Chinook salmon	7
CR chum salmon	17
LCR coho salmon	24
LCR steelhead	26
UWR steelhead	4

LCR Chinook Salmon. This species includes all naturally-spawned populations of Chinook salmon in the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River; the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River; and progeny of seventeen artificial propagation programs. LCR Chinook populations exhibit three different life history types base on return timing and other features: fall-run (a.k.a. “tules”), late-fall-run (a.k.a. “brights”), and spring-run. The WLC-TRT identified 22 historical populations of LCR Chinook salmon – seven in the coastal subregion, six in the Columbia Gorge, and nine in the Cascade Range (Table 7).

Table 7. LCR Chinook salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) in Oregon populations. VH corresponds to "extirpated or nearly so" (E) in Washington populations.

Stratum		Spawning Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Ecological Subregion	Run Timing					
Coast Range	Fall	Grays River (WA)	E	E	L	E
		Elochoman River (WA)	E	H	L	E
		Mill, Germany, and Abernathy creeks (WA)	E	H	L	E
		Young Bay (OR)	H to VH	H	L	VH
		Big Creek (OR)	H to VH	H	L to M	VH
		Clatskanie River (OR)	H	M to H	L	VH
		Scappoose River (OR)	H to VH	M to H	L to M	VH
Columbia Gorge	Spring	White Salmon River (WA)	E	E	E	E
		Hood River (OR)	VH	VH	L	VH
	Fall	Upper Gorge (OR)	E	H	H	VH
		Upper Gorge (WA)	H to VH	H	L to M	E
		White Salmon River (WA)	E	H	H	E
		Lower Gorge (OR)	H to VH	H	L to M	VH
		Lower Gorge (WA)	E	H	H	E
		Hood River (OR)	H to VH	H to VH	L	VH
Cascade Range	Spring	Upper Cowlitz River (WA)	E	M	H	E
		Cispus River (WA)	E	M	H	E
		Tilton River (WA)	E	E	E	E
		Toutle River (WA)	E	H	L	E
		Kalama River (WA)	E	H	L	E
		Sandy River (OR)	M to H	L to M	M	M
		Lewis (WA)	E	M	H	E
	Fall	Lower Cowlitz River (WA)	E	M	M	E
		Upper Cowlitz River (WA)	E	M	E	E
		Lewis River (WA)	E	L	M	E
		Salmon Creek (WA)	E	M	M	E
		Sandy River (WA)	H to VH	H	L	VH
		Toutle River (WA)	E	M	M	E
		Coweeman River (WA)	E	L	M	E
		Kalama River (WA)	E	M	L	E
		Clackamas River (OR)	H to VH	H	L	H
		Washougal River (WA)	E	M	M	E
	Late Fall	Lewis River (WA)	VL	L	L	VL
		Sandy River (WA)	L	L to M	L	L

A/P ratings for most LCR Chinook salmon populations are currently "high" risk to "extirpated or nearly so". Spatial structure was generally rated "low" to "moderate" risk for most populations. Other than the Sandy River, Oregon LCR Chinook salmon populations were rated "high" or "very high" risk for diversity. In 2005, diversity risk for Clackamas River and Lower Gorge tributary fall Chinook salmon was rated “moderate”; now the risk is rated “high”. Most Washington LCR Chinook salmon populations are currently at “moderate” or “high” risk for diversity (Table 6).

Of the 32 historical populations in the ESU, 28 are extirpated or at “very high” risk. Based on the recovery plan analyses, all of the tule populations are “very high” risk except one that is considered at “high” risk. The modeling conducted in association with tule harvest management suggests that three of the populations (Coweeman, Lewis and Washougal) are at a somewhat lower risk. However, even these more optimistic evaluations suggest that the remaining 18 populations are at substantial risk because of very low natural origin spawner abundance (<100/population), high hatchery fraction, habitat degradation and harvest impacts. Overall, the new information does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

Limiting factors and threats to LCR Chinook salmon include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and near-shore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Reduced access to spawning and rearing habitat mainly as a result of tributary hydropower projects
- Hatchery-related effects
- Harvest-related effects on fall Chinook salmon
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- Reduced access to off-channel rearing habitat in the Lower Columbia River
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary
- Juvenile fish strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

CR Chum Salmon. This species includes all naturally-spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, and progeny of three artificial propagation programs. The WLC-TRT identified 17 historical populations of CR chum salmon and aggregated these into four strata (Myers *et al.* 2006; Table 8). Unlike other species in the WLC recovery domain, CR chum salmon spawning aggregations were identified in the mainstem Columbia River. These aggregations generally were included in the population associated with the nearest river basin. Three strata and eight historical populations of CR chum salmon occur within the action area (Table 8; of these, none are “viable” (McElhany *et al.* 2007).

Table 8. CR chum salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford *et al.* 2010). Risk ratings are very low (VL), low (L), moderate (M), high (H), and "extirpated or nearly so" (E).

Stratum		Spawning Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Ecological Subregion	Run Timing					
Coast Range	Fall	Young's Bay (OR)	*	*	*	*
		Grays River (WA)	VL	L	M	M
		Big Creek (OR)	*	*	*	*
		Elochoman River (WA)	E	E	L	E
		Clatskanie River (OR)	*	*	*	*
		Mill, Abernathy and Germany creeks (WA)	E	E	L	E
		Scappoose Creek (OR)	*	*	*	*
Columbia Gorge	Fall	Lower Gorge (OR)	*	*	*	*
		Lower Gorge (WA)	VL	VL	L	L
		Upper Gorge (OR)	*	*	*	*
		Upper Gorge (WA)	E	E	H	E
Cascade Range	Summer	Cowlitz River (WA)	E	E	H	E
	Fall	Cowlitz River (WA)	E	E	L	E
		Kalama River (WA)	E	E	L	E
		Salmon Creek (WA)	E	E	H	E
		Lewis River (WA)	E	E	L	E
		Clackamas River (OR)	*	*	*	*
		Washougal River (WA)	E	E	L	E
		Sandy River (OR)	*	*	*	*

* No viability risk was completed for Oregon chum salmon populations. Oregon rivers have occasional reports of a few chum salmon. Populations are functionally extinct, or the risk of extinction is very high.

The vast majority (14 out of 17) chum salmon populations remain "extirpated or nearly so". The Grays River and Lower Gorge populations showed a sharp increase in 2002, but have since declined back to relatively low abundance levels in the range of variation observed over the last several decades. Chinook and coho salmon populations in the Lower Columbia and Willamette show similar increases in the early 2000s followed by declines to typical recent levels, suggesting the increase in chum salmon may be related to ocean conditions. The Grays and Lower Gorge populations were rated "very low" risk for A/P, but all other populations were rated "extirpated or nearly so." Spatial structure was rated "low" for seven populations, one was has moderate risk and three have a "high" risk. Diversity risk was "high" for all populations except Grays (moderate) and Lower Gorge (very low). Recent data on the Washougal/mainstem Columbia population are not available, but they likely follow a pattern similar to the Grays and Lower Gorge populations. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

Limiting factors and threats to CR chum salmon include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and nearshore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system
- Degraded freshwater habitat, in particular of floodplain connectivity and function, channel structure and complexity, stream substrate, and riparian areas and large wood recruitment as a result of cumulative impacts of agriculture, forestry, and development
- Degraded stream flow as a result of hydropower and water supply operations
- Loss of access and loss of some habitat types as a result of passage barriers such as roads and railroads
- Reduced water quality
- Current or potential predation from hatchery-origin salmonids, including coho salmon
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- Reduced access to off-channel rearing habitat in the Lower Columbia River
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary
- Juvenile fish strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

LCR Coho Salmon. This species includes all naturally-spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood rivers; in the Willamette River to Willamette Falls, Oregon; and progeny of 25 artificial propagation programs. The WLC-TRT identified 24 historical populations of LCR coho salmon and divided these into two strata based on major run timing: early and late (Myers *et al.* 2006). Three strata and nine historical populations of LCR coho salmon occur within the action area (Table 9). Of these nine populations, Clackamas River is the only population characterized as “viable” (McElhany *et al.* 2007).

Table 9. LCR coho salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) in Oregon populations. VH corresponds to "extirpated or nearly so" (E) in Washington populations.

Stratum		Spawning Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Ecological Subregion	**Run Type**					
Coast Range	N*	Young's Bay (OR)	VH	VH	L	VH
		Big Creek (OR)	VH	H	L to M	VH
		Clatskanie River (OR)	H to VH	M	L	H
		Scappoose River (OR)	M to H	M	L to M	M
		Grays River (WA)	E	E	L	E
		Elochoman Creek (WA)	E	E	L	E
		Mill, Germany, and Abernathy Creeks (WA)	E	H	L	E
Columbia Gorge	N	Lower Gorge Tributaries (OR)	VH	H	L to M	VH
		Lower Gorge Tributaries (WA)	E	E	M	E
	S**	Upper Gorge Tributaries (WA)	E	E	M	E
		Hood River (OR)	VH	H	L	H
Cascade Range	N	Lower Cowlitz River (WA)	E	M	M	E
		Coweeman River (WA)	E	M	L	E
		Salmon Creek (WA)	E	E	M	E
	N and S	Upper Cowlitz River (WA)	E	H	M	E
		Cispus River (WA)	E	H	M	E
		Tilton River (WA)	E	H	M	E
		South Fork Toutle River (WA)	E	M	L	E
		North Fork Toutle River (WA)	E	H	M	E
		Kalama River (WA)	E	M	L	E
		North Fork Lewis River (WA)	E	H	H	E
		East Fork Lewis River (WA)	E	M	L	E
		Washougal River (WA)	E	H	L	E
		Clackamas River (OR)	M	L to M	L	M
		Sandy River (OR)	H	L to M	M to H	H

*"Type N" are late-run fish that tend to undertake oceanic migrations to the north of the Columbia River, extending as far as northern British Columbia and southeast Alaska.
**"Type S" are early coho salmon that spawn in the upper reaches of larger rivers in the Lower Columbia River and in most rivers inland of the Cascade Crest that tend to migrate to the south of the Columbia River.

Three status evaluations of LCR coho salmon status, all based on WLC-TRT criteria, have been conducted since the last NMFS status review in 2005 (McElhany *et al.* 2007, Beamesderfer *et al.* 2010, LCFRB 2010). Of the 27 historical populations in the ESU, 24 are at "very high" risk. The remaining three populations (Sandy, Clackamas and Scappoose) are at "moderate" or "high" risk (Ford *et al.* 2010).

In Oregon, the Scappoose Creek and Clackamas River populations have "moderate" risk ratings for A/P, while the rest are rated "high" or "very high" risk. All of the Washington populations have "extirpated or nearly so" A/P ratings. Spatial diversity is rated "moderate" or "low" risk for all the populations, except the North Fork Lewis River, which has a "high" risk rating for spatial structure. All LCR coho salmon populations, except the Clackamas and Sandy river populations (low risk), are at "moderate" or "high" risk for diversity. All of the Washington side populations are at "very high" risk, although uncertainty is high because of a lack of adult spawner surveys. As was noted in the 2005 status review, smolt traps indicate some natural production in Washington populations, though given the high fraction of hatchery origin spawners suspected to occur in these populations it is not clear that any are self-sustaining. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

Limiting factors and threats to LCR coho salmon include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and near-shore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system
- Fish passage barriers that limit access to spawning and rearing habitats
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Hatchery-related effects
- Harvest-related effects
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- Reduced access to off-channel rearing habitat in the Lower Columbia River
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary
- Juvenile fish strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

LCR Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between and including the Cowlitz and Wind rivers, Washington; in the Willamette and Hood rivers, Oregon; and progeny of ten artificial propagation programs; but excluding all steelhead from the upper Willamette River basin above Willamette Falls, Oregon, and from the Little and Big White Salmon rivers, Washington.

Summer steelhead return to freshwater long before spawning. Winter steelhead, in contrast, return from the ocean much closer to maturity and spawn within a few weeks. Summer steelhead spawning areas in the Lower Columbia River are found above waterfalls and other features that create seasonal barriers to migration. Where no temporal barriers exist, the winter-run life history dominates. Six strata and 23 historical populations of LCR steelhead occur within the action area (Table 10).

Table 10. LCR steelhead strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) in Oregon populations. VH corresponds to "extirpated or nearly so" (E) in Washington populations.

Stratum: Ecological Subregion	Stratum: Run Timing	Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Columbia Gorge	Summer	Wind River (WA)	VL	L	VL	L
		Hood River (OR)	H	M	L	VH
	Winter	Lower Gorge (OR)	H	L	L	M to H
		Lower Gorge (WA)	H	M	VL	H
		Upper Gorge (OR)	M	M to H	L	VH
		Upper Gorge (WA)	H	M	M	E
		Hood River (OR)	M	M	L	M
West Cascade Range	Summer	Kalama River (WA)	L	M	VL	M
		North Fork Lewis River (WA)	E	E	E	E
		East Fork Lewis River (WA)	E	M	VL	E
		Washougal River (WA)	M	M	VL	M
	Winter	Cispus River (WA)	E	M	M	E
		Tilton river (WA)	E	H	M	E
		Upper Cowlitz River (WA)	E	M	M	E
		Lower Cowlitz River (WA)	H	M	M	H
		North Fork Toutle River (WA)	E	L	L	E
		South Fork Toutle River (WA)	M	L	VL	M
		Coweeman River (WA)	H	VL	VL	H
		Kalama River (WA)	H	L	VL	H
		North Fork Lewis River (WA)	E	M	M	E
		East Fork Lewis River (WA)	M	M	VL	M
		Salmon Creek (WA)	E	M	VL	E
		Washougal River (WA)	H	M	VL	H
		Sandy River (OR)	H	M	M to H	VH
		Clackamas River (OR)	L	L to M	L	L to M

All of the populations increased in abundance during the early 2000s, generally peaking in 2004. Most populations have since declined back to levels within one standard deviation of the long-term mean. Exceptions are the Washougal summer run and North Fork Toutle winter run, which are still higher than the long-term average, and the Sandy, which is lower. In general, the populations do not show any sustained dramatic changes in abundance or fraction of hatchery origin spawners since the 2005 status review (Ford *et al.* 2010).

Limiting factors and threats to LCR steelhead include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and nearshore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and recruitment of large wood, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Reduced access to spawning and rearing habitat mainly as a result of tributary hydropower projects and lowland development
- Avian and marine mammal predation in the lower mainstem Columbia River and estuary.
- Hatchery-related effects
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- Reduced access to off-channel rearing habitat in the Lower Columbia River
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary
- Juvenile fish strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

UWR Chinook Salmon. This species includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River; in the Willamette River and its tributaries above Willamette Falls, Oregon; and progeny of seven artificial propagation programs. All seven historical populations of UWR Chinook salmon identified by the WLC-TRT occur within the action area and are contained within a single ecological subregion, the western Cascade Range (Table 11); only the Clackamas population is characterized as "viable" (McElhany *et al.* 2007).

Table 11. Scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk for UWR Chinook salmon (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Extinction Risk
Clackamas River	M	M	L	M
Molalla River	VH	H	H	VH
North Santiam River	VH	H	H	VH
South Santiam River	VH	M	M	VH
Calapooia River	VH	H	VH	VH
McKenzie River	VL	M	M	L
Middle Fork Willamette River	VH	H	H	VH

Consideration of data collected since the last status review in 2005 has confirmed the high fraction of hatchery origin fish in all of the populations of this species (even the Clackamas and McKenzie rivers have hatchery fractions above WLC-TRT viability thresholds). All of the UWR Chinook salmon populations have "moderate" or "high" risk ratings for diversity. The Clackamas and McKenzie river populations currently have the best risk ratings for A/P, spatial structure, and diversity. Clackamas River Chinook salmon have a "low" risk rating for spatial structure.

The new data have also highlighted the substantial risks associated with pre-spawning mortality. Although recovery plans are targeting key limiting factors for future actions, there have been no significant on-the-ground-actions since the last status review to resolve the lack of access to historical habitat above dams nor have there been substantial actions removing hatchery fish from the spawning grounds. Overall, the new information does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

Limiting factors and threats to UWR Chinook salmon include (ODFW and NMFS 2011, NOAA Fisheries 2011):

- Significantly reduced access to spawning and rearing habitat because of tributary dams
- Degraded freshwater habitat, especially floodplain connectivity and function, channel structure and complexity, and riparian areas and large wood recruitment as a result of cumulative impacts of agriculture, forestry, and development
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development
- Hatchery-related effects
- Anthropogenic introductions of non-native species and out-of-ESU races of salmon or steelhead have increased predation on, and competition with, native UWR Chinook salmon
- Ocean harvest rates of approximately 30%

UWR Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River. The WLC-TRT identified five historical populations of UWR steelhead, all with winter run timing (Myers *et al.* 2006). UWR steelhead are currently found in many tributaries that drain the west side of the upper Willamette River basin. Analysis of historical observations, hatchery records, and genetic analysis strongly suggested that many of these spawning aggregations are the result of recent introductions and do not represent a historical population. Nevertheless, the WLC-TRT recognized that these tributaries may provide juvenile rearing habitat or may be temporarily (for one or more generations) colonized during periods of high abundance. One stratum and five historical populations of UWR steelhead occur within the action area (Table 12), although the west-side tributaries population was included only because it is important to the species as a whole, and not because it is independent. Summer steelhead have become established in the McKenzie River where historically no steelhead existed, although these fish were not considered in the identification of historical populations. Hatchery summer-run steelhead that are produced and released in the subbasins are from an out-of-basin stock and are not part of the DPS (ODFW and NMFS 2011).

Table 12. Scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk for UWR steelhead (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Extinction Risk
Molalla River	VL	M	M	L
North Santiam River	VL	M	H	L
South Santiam River	VL	M	M	L
Calapooia River	M	M	VH	M

Since the last status review in 2005, UWR steelhead initially increased in abundance but subsequently declines and current abundance is at the levels observed in the mid-1990s when the DPS was first listed. The DPS appears to be at lower risk than the UWR Chinook salmon ESU, but continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The elimination of winter run hatchery release in the basin reduces hatchery threats, but non-native summer steelhead hatchery releases are still a concern for species diversity. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

Limiting factors and threats to UWR steelhead include (ODFW and NMFS 2011, NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, and stream flow have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development
- Reduced access to spawning and rearing habitats mainly as a result of artificial barriers in spawning tributaries
- Hatchery-related effects: impacts from the non-native summer steelhead hatchery program
- Anthropogenic introductions of non-native species and out-of-ESU races of salmon or steelhead have increased predation and competition on native UWR steelhead.

Southern DPS Green Sturgeon. Two DPSs have been defined for green sturgeon: a northern DPS (spawning populations in the Klamath and Rogue rivers) and a southern DPS (spawners in the Sacramento River). Southern green sturgeon includes all naturally-spawned populations of green sturgeon that occur south of the Eel River in Humboldt County, California. When not spawning, this anadromous species is broadly distributed in nearshore marine areas from Mexico to the Bering Sea. Although it is commonly observed in bays, estuaries, and sometimes the deep riverine mainstem in lower elevation reaches of non-natal rivers along the west coast of North America, the distribution and timing of estuarine use are poorly understood.

In addition to the Puget Sound recovery domain, southern green sturgeon occur in the WLC recovery domain, Oregon Coast (OC), and Southern Oregon/Northern California Coasts (SONCC) recovery domains. However, green sturgeon habitat in the PS recovery area was not designated as critical habitat.

The principal factor for the decline of southern green sturgeon is the reduction of its spawning area to a single known population limited to a small portion of the Sacramento River. It is currently at risk of extinction primarily because of human-induced ‘‘takes’’ involving elimination of freshwater spawning habitat, degradation of freshwater and estuarine habitat quality, water diversions, fishing, and other causes (USDC 2010). Adequate water flow and temperature are issues of concern. Water diversions pose an unknown but potentially serious threat within the Sacramento and Feather Rivers and the Sacramento River Delta. Poaching also poses an unknown but potentially serious threat because of high demand for sturgeon caviar. The effects of contaminants and nonnative species are also unknown but potentially serious threats. As mentioned above, retention of green sturgeon in both recreational and commercial fisheries is now prohibited within the western states, but the effect of capture/release in these fisheries is unknown. There is evidence of fish being retained illegally, although the magnitude of this activity likely is small (NOAA Fisheries 2011).

The viability of this species is still under assessment.

Eulachon. The southern DPS of eulachon occur in four recovery domains: Puget Sound, WLC, OC, and SONCC. The ESA-listed population of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Core populations for this species include the Fraser River, Columbia River and (historically) the Klamath River. Eulachon leave saltwater to spawn in their natal streams late winter through early summer, and typically spawn at night in the lower reaches of larger rivers fed by snowmelt. After hatching, larvae are carried downstream and widely dispersed by estuarine and ocean currents. Eulachon movements in the ocean are poorly known although the amount of eulachon bycatch in the pink shrimp fishery seems to indicate that the distribution of these organisms overlap in the ocean.

In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River with no evidence of returning to their former population levels since then (Drake *et al*. 2008). Persistent low returns and landings of eulachon in the Columbia River from 1993 to 2000 prompted the states of Oregon and Washington to adopt a Joint State Eulachon Management Plan in 2001 that provides for restricted harvest management when parental run strength, juvenile production, and ocean productivity forecast a poor return (WDFW and ODFW 2001). Despite a brief period of improved returns in 2001–2003, the returns and associated commercial landings have again declined to the very low levels observed in the mid-1990s (JCRMS 2009), and since 2005, the fishery has operated at the most conservative level allowed in the management plan (JCRMS 2009). Large commercial and recreational fisheries have occurred in the Sandy River in the past. The most recent commercial harvest in the Sandy River was in 2003. No commercial harvest has been recorded for the Grays River from 1990 to the present, but larval sampling has confirmed successful spawning in recent years (USDC 2011a).

The primary factors responsible for the decline of the southern DPS of eulachon are changes in ocean conditions due to climate change (Gustafson *et al.* 2010, Gustafson *et al*. 2011), particularly in the southern portion of its range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. Additional factors include climate-induced change to freshwater habitats, dams and water diversions (particularly in the Columbia and Klamath Rivers where hydropower generation and flood control are major activities), and bycatch of eulachon in commercial fisheries (NOAA Fisheries 2011).

Other limiting factors include (Gustafson *et al.* 2010, Gustafson *et al*. 2011):

- Adverse effects related to dams and water diversions
- Artificial fish passage barriers
- Increased water temperatures, insufficient streamflow
- Altered sediment balances
- Water pollution
- Over-harvest
- Predation

Interior Columbia (IC) Recovery Domain. Species in the IC recovery domain include UCR spring-run Chinook salmon, SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, UCR steelhead, MCR steelhead, and SRB steelhead. The IC-TRT identified 82 populations of those species based on genetic, geographic (hydrographic), and habitat characteristics (Table 13). In some cases, the IC-TRT further aggregated populations into "major groupings" based on dispersal distance and rate, and drainage structure, primarily the location and distribution of large tributaries (IC-TRT 2003). All 82 populations identified use the lower mainstem of the Snake River, the mainstem of the Columbia River, and the Columbia River estuary, or part thereof, for migration, rearing, and smoltification.

On August 15, 2011, NMFS announced the results of an ESA 5-year review for salmon and steelhead in the IC Recovery Domain (76 FR 50448). After reviewing new information on the viability of these species, ESA section 4 listing factors, and efforts being made to protect the species, NMFS concluded that all salmon and steelhead in the Mid-Columbia, Upper Columbia, and Snake River sub-domains should retain their 2005 (for salmon) or 2006 (for steelhead) listing classifications.

Table 13. Populations of ESA-listed salmon and steelhead in the IC recovery domain.

Species	Populations
UCR spring-run Chinook salmon	3
SR spring/summer Chinook salmon	31
SR fall-run Chinook salmon	1
SR sockeye salmon	1
UCR steelhead	4
MCR steelhead	17
SRB steelhead	25

The IC-TRT also recommended viability criteria that follow the VSP framework (McElhany *et al.* 2006) and described biological or physical performance conditions that, when met, indicate a population or species has a 5% or less risk of extinction over a 100-year period (IC-TRT 2007; see also NRC 1995).

UCR Spring-run Chinook Salmon. This species includes all naturally-spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington (excluding the Okanogan River), the Columbia River from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side) upstream to Chief Joseph Dam in Washington, and progeny of six artificial propagation programs. The IC-TRT identified four independent populations of UCR spring-run Chinook salmon in the upriver tributaries of Wenatchee, Entiat, Methow, and Okanogan (extirpated), but no major groups due to the relatively small geographic area affected (IC-TRT 2003, Ford *et al.* 2010)(Table 14).

Table 14. Scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for winter-run UCR Chinook salmon (Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Wenatchee River	H	H	H	H
Entiat River	H	H	H	H
Methow River	H	H	H	H
Okanogan River	n/a	n/a	n/a	n/a

The UCR spring-run Chinook salmon ESU is not currently meeting the viability criteria (adapted from the IC-TRT) in the Upper Columbia Recovery Plan. A/P remains at "high" risk for each of the three extant populations in this MPG/ESU (Table 14). The 10-year geometric mean abundance of adult natural origin spawners has increased for each population relative to the levels for the 1981-2003 series, but the estimates remain below the corresponding IC-TRT thresholds. Estimated productivity (spawner to spawner return rate at low to moderate escapements) was on average lower over the years 1987-2009 than for the previous period. The combinations of current abundance and productivity for each population result in a "high" risk rating. The composite SS/D risks for all three of the extant populations in this MPG are at "high" risk. The spatial processes component of the SS/D risk is "low" for the Wenatchee River and Methow River populations and "moderate" for the Entiat River (loss of production in lower section increases effective distance to other populations). All three of the extant populations in this MPG are at "high" risk for diversity, driven primarily by chronically high proportions of hatchery-origin spawners in natural spawning areas and lack of genetic diversity among the natural-origin spawners (Ford *et al.* 2010).

Increases in natural origin abundance relative to the extremely low spawning levels observed in the mid-1990s are encouraging; however, average productivity levels remain extremely low.

Overall, the viability of UCR spring-run Chinook salmon ESU has likely improved somewhat since the last status review, but the ESU is still clearly at “moderate-to-high” risk of extinction (Ford *et al.* 2010).

Limiting factors and threats to the UCR spring-run Chinook salmon ESU include (UCSRB 2007, NOAA Fisheries 2011):

- Mainstem Columbia River hydropower–related adverse effects: upstream and downstream fish passage, ecosystem structure and function, flows, and water quality
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Degraded estuarine and nearshore marine habitat
- Hatchery related effects: including past introductions and persistence of non-native (exotic) fish species continues to affect habitat conditions for listed species
- Harvest in Columbia River fisheries

<u>SR Spring/summer-run Chinook Salmon</u>. This species includes all naturally-spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins; and progeny of fifteen artificial propagation programs. The IC-TRT identified 27 extant and four extirpated populations of SR spring/summer-run Chinook salmon, and aggregated these into major population groups (IC-TRT 2003, Ford *et al.* 2010). Each of these populations faces a “high” risk of extinction (Ford *et al.* 2010) (Table 15).

Population level status ratings remain at “high” risk across all MPGs within the ESU, although recent natural spawning abundance estimates have increased, all populations remain below minimum natural origin abundance thresholds (Table 15). Spawning escapements in the most recent years in each series are generally well below the peak returns but above the extreme low levels in the mid-1990s. Relatively low natural production rates and spawning levels below minimum abundance thresholds remain a major concern across the ESU.

The ability of SR spring/summer-run Chinook salmon populations to be self-sustaining through normal periods of relatively low ocean survival remains uncertain. Factors cited by Good *et al.* (2005) remain as concerns or key uncertainties for several populations. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

Table 15. SR spring/summer-run Chinook salmon ecological subregions, populations, and scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for SR spring/summer-run Chinook salmon (Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) and extirpated (E).

Ecological Subregions	Spawning Populations (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Lower Snake River	Tucannon River	H	M	M	H
	Asotin River				E
Grande Ronde and Imnaha rivers	Wenaha River	H	M	M	H
	Lostine/Wallowa River	H	M	M	H
	Minam River	H	M	M	H
	Catherine Creek	H	M	M	H
	Upper Grande Ronde R.	H	M	H	H
	Imnaha River	H	M	M	H
	Big Sheep Creek				E
	Lookingglass Creek				E
South Fork Salmon River	Little Salmon River	*	*	*	H
	South Fork mainstem	H	M	M	H
	Secesh River	H	L	L	H
	EF/Johnson Creek	H	L	L	H
Middle Fork Salmon River	Chamberlin Creek	H	L	L	H
	Big Creek	H	M	M	H
	Lower MF Salmon	H	M	M	H
	Camas Creek	H	M	M	H
	Loon Creek	H	M	M	H
	Upper MF Salmon	H	M	M	H
	Pistol Creek				E
	Sulphur Creek	H	M	M	H
	Bear Valley Creek	H	L	L	H
	Marsh Creek	H	L	L	H
Upper Mainstem Salmon	N. Fork Salmon River	H	L	L	H
	Lemhi River	H	H	H	H
	Pahsimeroi River	H	H	H	H
	Upper Salmon-lower mainstem	H	L	L	H
	East Fork Salmon River	H	H	H	H
	Yankee Fork	H	H	H	H
	Valley Creek	H	M	M	H
	Upper Salmon main	H	M	M	H
	Panther Creek				E

* Insufficient data.

Limiting factors and threats to the SR spring/summer-run Chinook salmon ESU include (NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, elevated water temperature, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Mainstem Columbia River and Snake River hydropower impacts
- Harvest-related effects
- Predation

SR Fall-run Chinook Salmon. This species includes all naturally-spawned populations of fall-run Chinook salmon in the mainstem Snake River below Hells Canyon Dam, and in the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River, and progeny of four artificial propagation programs. The IC-TRT identified three populations of this species, although only the lower mainstem population exists at present, and it spawns in the lower main stem of the Clearwater, Imnaha, Grande Ronde, Salmon and Tucannon rivers. The extant population of Snake River fall-run Chinook salmon is the only remaining population from an historical ESU that also included large mainstem populations upstream of the current location of the Hells Canyon Dam complex (IC-TRT 2003, Ford *et al.* 2010).

The recent increases in natural origin abundance are encouraging. However, hatchery origin spawner proportions have increased dramatically in recent years – on average, 78% of the estimated adult spawners have been hatchery origin over the most recent brood cycle. The apparent leveling off of natural returns in spite of the increases in total brood year spawners may indicate that density dependent habitat effects are influencing production or that high hatchery proportions may be influencing natural production rates. The A/P risk rating for the population is "moderate." The population is at moderate risk for diversity and spatial structure. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010). Given the combination of current A/P and SS/D ratings summarized above, the overall viability rating for Lower SR fall Chinook salmon would be rated as "maintained."[6]

Limiting factors and threats to SR fall-run Chinook salmon include (NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, and channel structure and complexity have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Lost access to historic habitat above Hells Canyon and other Snake River dams
- Harvest-related effects
- Mainstem Columbia River and Snake River hydropower impacts
- Hatchery-related effects
- Degraded estuarine and nearshore habitat

[6] "Maintained" population status is for populations that do not meet the criteria for a viable population but do support ecological functions and preserve options for ESU/DPS recovery.

SR Sockeye Salmon. This species includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, and artificially-propagated sockeye salmon from the Redfish Lake captive propagation program. The IC-TRT identified historical sockeye salmon production in at least five Stanley Basin and Sawtooth Valley lakes and in lake systems associated with Snake River tributaries currently cut off to anadromous access (*e.g.,* Wallowa and Payette Lakes), although current returns of SR sockeye salmon are extremely low and limited to Redfish Lake (IC-TRT 2007).

This species is still at extremely high risk across all four basic risk measures (abundance, productivity, spatial structure and diversity. Although the captive brood program has been successful in providing substantial numbers of hatchery produced *O. nerka* for use in supplementation efforts, substantial increases in survival rates across life history stages must occur in order to re-establish sustainable natural production (Hebdon *et al.* 2004, Keefer *et al.* 2008). Overall, although the risk status of the Snake River sockeye salmon ESU appears to be on an improving trend, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

The key factor limiting recovery of SR sockeye salmon ESU is survival outside of the Stanley Basin. Portions of the migration corridor in the Salmon River are impeded by water quality and temperature (Idaho Department of Environmental Quality 2011). Increased temperatures may reduce the survival of adult sockeye returning to the Stanley River basin. The natural hydrological regime in the upper mainstem Salmon River basin has been altered by water withdrawals. In most years, sockeye adult returns to Lower Granite suffer catastrophic losses (*e.g.*, > 50% mortality in one year; Reed *et al.* 2003) before reaching the Stanley Basin, although the factors causing these losses have not been identified. In the Columbia and Lower Snake River migration corridor, predation rates on juvenile sockeye salmon are unknown, but terns and cormorants consume 12% of all salmon smolts reaching the estuary, and piscivorous fish consume an estimated 8% of migrating juvenile salmon (NOAA Fisheries 2011).

MCR Steelhead. This species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding steelhead from the Snake River basin; and progeny of seven artificial propagation programs. The IC-TRT identified 17 extant populations in this DPS (IC-TRT 2003). The populations fall into four major population groups: the Yakima River basin (four extant populations), the Umatilla/Walla-Walla drainages (three extant and one extirpated populations); the John Day River drainage (five extant populations) and the Eastern Cascades group (five extant and two extirpated populations) (Table 16) (NMFS 2009, Ford *et al.* 2010).

Table 16. Ecological subregions, populations, and scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for MCR steelhead (NMFS 2009, Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH). Maintained (MT) population status indicates that the population does not meet the criteria for a viable population but does support ecological functions and preserve options for recovery of the DPS.

Ecological Subregions	Population (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Cascade Eastern Slope Tributaries	Fifteenmile Creek	L	L	L	Viable
	Klickitat River	M	M	M	Not rated
	Eastside Deschutes River	L	M	M	Viable
	Westside Deschutes River	H	M	M	H*
	Rock Creek	H	M	M	H?
	White Salmon	Extinct	n/a	n/a	Extinct*
	Crooked River	Extinct	n/a	n/a	Extinct*
John Day River	Upper Mainstem	M	M	M	MT
	North Fork	VL	L	L	Highly Viable
	Middle Fork	M	M	M	MT
	South Fork	M	M	M	MT
	Lower Mainstem	M	M	M	MT
Walla Walla and Umatilla rivers	Umatilla River	M	M	M	MT
	Touchet River	M	M	M	H
	Walla Walla River	M	M	M	MT
Yakima River	Satus Creek	M	M	M	Viable/ MT
	Toppenish Creek	M	M	M	Viable/ MT
	Naches River	H	M	M	H
	Upper Yakima	H	H	H	H

* Re-introduction efforts underway (NMFS 2009).

There have been improvements in the viability ratings for some of the component populations, but the MCR steelhead DPS is not currently meeting the viability criteria (adopted from the IC-TRT) in the MCR steelhead recovery plan (NMFS 2009). In addition, several of the factors cited by Good *et al.* (2005) remain as concerns or key uncertainties. Natural origin spawning estimates of populations have been highly variable with respect to meeting minimum abundance thresholds. Straying frequencies into at least the Lower John Day River population are high. Returns to the Yakima River basin and to the Umatilla and Walla Walla Rivers have been higher over the most recent brood cycle, while natural origin returns to the John Day River have decreased. Out-of-basin hatchery stray proportions, although reduced, remain very high in the Deschutes River basin. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

The limiting factors and threats to MCR steelhead include (NMFS 2009, NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas, fish passage, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, tributary hydro system activities, and development
- Mainstem Columbia River hydropower–related impacts
- Degraded estuarine and nearshore marine habitat
- Hatchery-related effects
- Harvest-related effects
- Effects of predation, competition, and disease

UCR Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in streams in the Columbia River basin upstream from the Yakima River, Washington, to the U.S.-Canada border, and progeny of six artificial propagation programs. Four independent populations of UCR steelhead were identified by the IC-TRT in the same upriver tributaries as for the UC spring-run Chinook salmon (*i.e.*, Wenatchee, Entiat, Methow, and Okanogan; Table 17) and, similarly, no major population groupings were identified due to the relatively small geographic area involved (IC-TRT 2003, Ford *et al.* 2010). All extant populations are considered to be at high risk of extinction (Ford *et al.* 2010).

Table 17. Summary of the key elements (A/P, diversity, and SS/D) and scores used to determine current overall viability risk for UCR steelhead populations (Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Wenatchee River	H	H	H	H
Entiat River	H	H	H	H
Methow River	H	H	H	H
Okanogan River	H	H	H	H

UCR steelhead populations have increased in natural origin abundance in recent years, but productivity levels remain low. The proportions of hatchery origin returns in natural spawning areas remain extremely high across the DPS, especially in the Methow and Okanogan river populations. The modest improvements in natural returns in recent years are probably primarily the result of several years of relatively good natural survival in the ocean and tributary habitats. With the exception of the Okanogan population, the UCR populations rated as “low” risk for spatial structure. The “high” risk ratings for SS/D are largely driven by chronic high levels of hatchery spawners within natural spawning areas and lack of genetic diversity among the populations. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

The limiting factors and threats to the UCR steelhead DPS include (UCSRB 2007, NOAA Fisheries 2011):

- Mainstem Columbia River hydropower–related adverse effects.
- Impaired tributary fish passage.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Effects of predation, competition, and disease mortality: Fish management, including past introductions and persistence of non-native (exotic) fish species continues to affect habitat conditions for listed species.
- Hatchery-related effects.
- Harvest-related effects.

SRB Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, and progeny of six artificial propagation programs. The IC-TRT identified 25 historical populations in five major groups (Table 18) (IC-TRT 2006, Ford *et al.* 2010). The IC-TRT has not assessed the viability of this species.

The level of natural production in the two populations with full data series and the Asotin Creek index reaches is encouraging, but the status of most populations in this DPS remains highly uncertain. Population-level natural origin abundance and productivity inferred from aggregate data and juvenile indices indicate that many populations are likely below the minimum combinations defined by the IC-TRT viability criteria. The relative proportion of hatchery fish in natural spawning areas near major hatchery release sites is highly uncertain. There is little evidence for substantial change in ESU viability relative to the previous BRT and IC-TRT reviews. Overall, therefore, the new information considered does not indicate a change in the biological risk category since the last status review (Ford *et al.* 2010).

Table 18. Ecological subregions, populations, and scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for SRB steelhead (Ford *et al.* 2010). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH). Maintained (MT) population status indicates that the population does not meet the criteria for a viable population but does support ecological functions and preserve options for recovery of the DPS.

Ecological subregions	Spawning Populations (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk*
Lower Snake River	Tucannon River	H??	M	M	H??*
	Asotin Creek	MT	M	M	H
Grande Ronde River	Lower Grande Ronde	**	M	M	Not rated
	Joseph Creek	VL	L	L	Highly viable
	Upper Grande Ronde	M	M	M	MT
	Wallowa River	H	L	L	H
Clearwater River	Lower Clearwater	M	L	L	MT
	South Fork Clearwater	H	M	M	H
	Lolo Creek	H	M	M	H
	Selway River	H	L	L	H
	Lochsa River	H	L	L	H
Salmon River	Little Salmon River	M	M	M	MT
	South Fork Salmon	H	L	L	H
	Secesh River	H	L	L	H
	Chamberlain Creek	H	L	L	H
	Lower MF Salmon	H	L	L	H
	Upper MF Salmon	H	L	L	H
	Panther Creek	M	M	H	H
	North Fork Salmon	M	M	M	MT
	Lemhi River	M	M	M	MT
	Pahsimeroi River	M	M	M	MT
	East Fork Salmon	M	M	M	MT
	Upper Main Salmon	M	M	M	M?
Imnaha	Imnaha River	M		M	,

*There is some uncertainty regarding these ratings due to a lack of population –specific abundance data.

Limiting factors and threats to the SRB steelhead DPS include (IC-TRT 2006, NOAA Fisheries 2011):

- Mainstem Columbia River hydropower–related adverse effects
- Impaired tributary fish passage
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Impaired water quality and increased water temperature

- Related harvest effects, particularly for B-run steelhead
- Predation
- Genetic diversity effects from out-of-population hatchery releases

Oregon Coast (OC) Recovery Domain. The OC recovery domain includes OC coho salmon, southern DPS green sturgeon, and eulachon, covering Oregon coastal streams south of the Columbia River and north of Cape Blanco. Streams and rivers in this area drain west into the Pacific Ocean, and vary in length from less than a mile to more than 210 miles in length.

OC Coho Salmon. This species includes all naturally-spawned populations of coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco, including the Cow Creek population, which is stock #37 of Oregon Department of Fish and Wildlife's (ODFW) coho hatchery program. OC coho salmon were first listed in February 2008. As part of a legal settlement agreement in 2008, NMFS completed a new status review for the ESU. In 2011, NMFS issued a final rule re-promulgating the threatened listing for Oregon Coast coho salmon (76 FR 35755).

The OC-TRT identified 56 populations; 21 independent and 35 dependent. The dependent populations were dependent on strays from other populations to maintain them over long time periods. The TRT also identified five biogeographic strata (Table 19) (Lawson *et al.* 2007).

Wainwright *et al.* (2008) determined that the weakest strata of OC coho salmon were in the North Coast and Mid-Coast of Oregon, which had only "low" certainty of being persistent. The strongest strata were the Lakes and Mid-South Coast, which had "high" certainty of being persistent. To increase certainty that the ESU as a whole is persistent, they recommended that restoration work should focus on those populations with low persistence, particularly those in the North Coast, Mid-Coast, and Umpqua strata.

A 2010 BRT (Stout *et al.* 2011) noted significant improvements in hatchery and harvest practices have been made. However, harvest and hatchery reductions have changed the population dynamics of the ESU. It has not been demonstrated that productivity during periods of poor marine survival is now adequate to sustain the ESU. Recent increases in adult escapement do not provide strong evidence that the century-long downward trend has changed. The ability of the OC coho salmon ESU to survive another prolonged period of poor marine survival remains in question.

Current concerns for spatial structure focus on the Umpqua River. Of the four populations in the Umpqua stratum, two, the North Umpqua and South Umpqua, were of particular concern. The North Umpqua is controlled by Winchester Dam and has historically been dominated by hatchery fish. Hatchery influence has recently been reduced, but the natural productivity of this population remains to be demonstrated. The South Umpqua is a large, warm system with degraded habitat. Spawner distribution appears to be seriously restricted in this population, and it is probably the most vulnerable of any population in this ESU to increased temperatures.

Table 19. OC coho salmon populations. Dependent Populations (D) are populations that historically would not have had a high likelihood of persisting in isolation for 100 years. These populations relied upon periodic immigration from other populations to maintain their abundance. Independent Populations are populations that historically would have had a high likelihood of persisting in isolation from neighboring populations for 100 years and are rated as functionally independent (FI) and potentially independent (PI) (McElhany *et al.* 2000, Lawson *et al.* 2007).

Stratum	Population	Type	Stratum	Population	Type
North Coast	Necanicum	PI	Mid-Coast (cont.)	Alsea	FI
	Ecola	D		Big (Alsea)	D
	Arch Cape	D		Vingie	D
	Short Sands	D		Yachats	D
	Nehalem	FI		Cummins	D
	Spring	D		Bob	D
	Watseco	D		Tenmile	D
	Tillamook	FI		Rock	D
	Netarts	D		Big (Siuslaw)	D
	Rover	D		China	D
	Sand	D		Cape	D
	Nestucca	FI		Berry	D
	Neskowin	D		Sutton	D
Mid-Coast	Salmon	PI	Lakes	Siuslaw	FI
	Devils	D		Siltcoos	PI
	Siletz	FI		Tahkenitch	PI
	Schoolhouse	D		Tenmile	PI
	Fogarty	D	Umpqua	Lower Umpqua	FI
	Depoe	D		Middle Umpqua	FI
	Rocky	D		North Umpqua	FI
	Spencer	D		South Umpqua	FI
	Wade	D	Mid-South Coast	Threemile	D
	Coal	D		Coos	FI
	Moolack	D		Coquille	FI
	Big (Yaquina)	D		Johnson	D
	Yaquina	FI		Twomile	D
	Theil	D		Floras	PI
	Beaver	PI		Sixes	PI

Current status of diversity shows improvement through the waning effects of hatchery fish on populations of OC coho salmon. In addition, recent efforts in several coastal estuaries to restore lost wetlands should be beneficial. However, diversity is lower than it was historically because of the loss of both freshwater and tidal habitat loss coupled with the restriction of diversity from very low returns over the past 20 years.

The BRT concluded that there is a moderate certainty of ESU persistence over the next 100 years and a low-to-moderate certainty that the ESU is sustainable for the foreseeable future, assuming no future trends in factors affecting the ESU. The NMFS issued a final determination to retain the ESA listing status, effective June 20, 2011. Thus, the February 2008 critical habitat designation and 4(d) regulations remain in effect (76 FR 35755).

Limiting factors and threats to the OC coho salmon ESU include (Stout *et al.* 2011, NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, instream mining, dams, road crossings, dikes, levees, etc.
- Fish passage barriers that limit access to spawning and rearing habitats
- Adverse climate, altered past ocean/marine productivity, and current ocean ecosystem conditions have favored competitors and predators and reduced salmon survival rates in freshwater rivers and lakes, estuaries, and marine environments

Southern Oregon and Northern California Coasts (SONCC) Recovery Domain. The SONCC recovery domain includes coho salmon, southern DPS green sturgeon, and eulachon. The SONCC recovery domain extends from Cape Blanco, Oregon, to Punta Gorda, California. This area includes many small-to-moderate-sized coastal basins, where high quality habitat occurs in the lower reaches of each basin, and three large basins (Rogue, Klamath and Eel) where high quality habitat is in the lower reaches, little habitat is provided by the middle reaches, and the largest amount of habitat is in the upper reaches of the subbasins

SONCC Coho Salmon. This species includes all naturally-spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California, and progeny of three artificial propagation programs. The SONCC-TRT identified 50 populations that were historically present based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity (Williams *et al.* 2006). In some cases, the SONCC-TRT also identified groups of populations referred to as "diversity strata" largely based on the geographical arrangement of the populations and basin-scale environmental and ecological characteristics. Of those populations, 13 strata and 17 populations occur within the Oregon (Table 20). On August 15, 2011, NMFS Southwest Region announced the results of a 5-year review for SONCC coho salmon (76 FR 50447). After reviewing the available information, they concluded that this species should retain its threatened listing classification.

In most cases, populations appear to be well below the proposed viability thresholds, and the steps needed to move them toward viability will be similar, regardless of the specific recovery targets, which can be refined as more information becomes available. The SONCC-TRT developed a framework to assess the viability of this species and recommended: (1) Securing all extant populations, (2) collecting distribution and abundance data, (3) minimizing straying from hatcheries to natural spawning areas, and (4) beginning critical research on climate change and its potential impacts (Williams *et al*. 2008). Although long-term data on abundance of SONCC coho salmon are scarce, available evidence from shorter-term research and monitoring efforts indicate that conditions have worsened for populations since the last formal status review was published (Good *et al.* 2005, Williams *et al.* 2011). Many independent populations are well below low-risk abundance targets, and several are likely below the high-risk depensation thresholds specified by the TRT (Williams *et al.* 2011).

Table 20. SONCC coho salmon populations in Oregon. Dependent populations (D) are populations that historically would not have had a high likelihood of persisting in isolation for 100 years. These populations relied upon periodic immigration from other populations to maintain their abundance. Independent populations are populations that historically would have had a high likelihood of persisting in isolation from neighboring populations for 100 years and are rated as functionally independent (FI) and potentially independent (PI). Two ephemeral populations (E) are defined as populations both small enough and isolated enough that they are only intermittently present (McElhany *et al.* 2000, Williams *et al.* 2006).

Population		Population Type
River Basin	**Subbasin**	
Elk River		FI
Mill Creek		D
Hubbard Creek		E
Brush Creek		D
Mussel Creek		D
Euchre Creek		E
Rogue River*	Lower Rogue River	PI
	Illinois River*	FI
	Mid Rogue/Applegate*	FI
	Upper Rogue River	FI
Hunter Creek		D
Pistol River		D
Chetco River		FI
Winchuck River		PI
Smith River*		FI
Klamath River*	Middle Klamath River	PI
	Upper Klamath River	FI

* Populations that also occur partly in California.

Limiting factors and threats to the SONCC coho salmon ESU include (NMFS 2007, NOAA Fisheries 2011):

- Lack of floodplain and channel structure
- Impaired water quality
- Altered hydrologic function due to altered amount and timing of river flows.
- Degraded riparian forest conditions and large wood recruitment
- Altered sediment supply
- Degraded stream substrate
- Impaired estuarine function.
- Impaired fish passage
- Hatchery-related adverse effects
- Effects of predation, competition, and disease mortality

Threats from natural or man-made factors have worsened in the past 5 years, primarily due to four factors: small population dynamics, climate change, multi-year drought, and poor ocean survival conditions (NOAA Fisheries 2011).

2.2.2 Status of the Critical Habitats

The status of critical habitat was based primarily on a watershed-level analysis of conservation value that focused on the presence of listed ESA-listed species and physical features (*i.e.*, the PCEs) that are essential to their conservation. The analysis for the 2005 designations of salmon and steelhead species was completed by Critical Habitat Analytical Review Teams (CHARTs) that focused on large geographical areas corresponding approximately to recovery domains (NOAA Fisheries 2005). Each watershed was ranked using a conservation value attributed to the quantity of stream habitat with PCEs, the present condition of those PCEs, the likelihood of achieving PCE potential (either naturally or through active restoration), support for rare or important genetic or life history characteristics, support for abundant populations, and support for spawning and rearing populations. In some cases, our understanding of these interim conservation values has been further refined by the work of TRTs and other recovery planning efforts that have better explained the habitat attributes, ecological interactions, and population characteristics important to each species.

A similar team, referred to as a Critical Habitat Review Team (CHRT) was convened for southern DPS green sturgeon, as reported in the proposed rule (73 FR 17757). That team identified and analyzed the conservation value of particular areas occupied by southern green sturgeon, and unoccupied areas they felt may be necessary to ensure the conservation of the species. The CHRT did not identify those particular areas using hydrologic unit code (HUC) nomenclature, but did provide geographic place names for those areas, including the names of freshwater rivers, the bypasses, the Sacramento-San Joaquin Delta, coastal bays and estuaries, and coastal marine areas (within 110 m depth) extending from the California/Mexico border north to Monterey Bay, California, and from the Alaska/Canada border northwest to the Bering Strait; and certain coastal bays and estuaries in California, Oregon, and Washington.

NMFS designated critical habitat for all salmon species considered in this opinion, except LCR coho salmon, for which critical habitat has not been proposed nor designated and eulachon, for which critical habitat is proposed but not yet designated. The CHARTs completed assessed factors of PCEs for 12 species of ESA-listed salmon and steelhead in the Puget Sound, WLC, and IC recovery domains. A CHART also did an initial assessment of PCEs for coho salmon in the Oregon Coast recovery domain (NOAA Fisheries 2005). Each CHART consisted of Federal biologists and habitat specialists from NMFS, the Fish and Wildlife Service, the Forest Service, and the Bureau of Land Management, with demonstrated expertise regarding salmon and steelhead habitat and related protective efforts within that domain.

Each CHART assessed biological information pertaining to areas under consideration for designation as critical habitat to identify the areas occupied by listed salmon and steelhead, determine whether those areas contained PCEs essential for the conservation of those species, and whether unoccupied areas existed within the historical range of the listed salmon and steelhead that may also be essential for conservation. The CHARTs assigned a 0 to 3 point score for the PCEs in each HUC5 watershed for:

Factor 1. Quantity,
Factor 2. Quality – Current Condition,
Factor 3. Quality – Potential Condition,
Factor 4. Support of Rarity Importance,
Factor 5. Support of Abundant Populations, and
Factor 6. Support of Spawning/Rearing.

Thus, the quality of habitat in a given watershed was characterized by the scores for Factor 2 (quality - current condition), which considers the existing condition of the quality of PCEs in the HUC5 watershed; and Factor 3 (quality – potential condition), which considers the likelihood of achieving PCE potential in the HUC5 watershed, either naturally or through active conservation/restoration, given known limiting factors, likely biophysical responses, and feasibility. The meaning of these scores is given below:

PCE Quality – Current Condition	PCE Quality – Potential Condition
3 = PCEs are in good to excellent condition.	3 = PCEs are highly functioning and are at their historical potential.
2 = PCEs are in fair to good condition.	2 = PCEs are reduced, but have high improvement potential.
1 = PCEs are in fair to poor condition.	1 = PCEs may have some improvement potential.
0 = PCEs are in poor condition.	0 = PCEs have little or no improvement potential.

Each CHART then scored each habitat area based on the quantity and quality of the physical and biological features; rated each habitat area as having a ''high,'' ''medium,'' or ''low'' conservation value; and identified management actions that could affect habitat for salmon and steelhead.

The ESA gives the Secretary of Commerce discretion to exclude areas from designation if he determines that the benefits of exclusion outweigh the benefits of designation. Considering economic factors and information from CHARTs, NMFS partially or completely excluded the following types of areas from the 2005 critical habitat designations:

1. Military areas. All military areas were excluded because of the current national priority on military readiness, and in recognition of conservation activities covered by military integrated natural resource management plans.
2. Tribal lands. Native American lands were excluded because of the unique trust relationship between tribes and the federal government, the federal emphasis on respect for tribal sovereignty and self governance, and the importance of tribal participation in numerous activities aimed at conserving salmon.
3. Areas With Habitat Conservation Plans. Some lands covered by habitat conservation plans were excluded because NMFS had evidence that exclusion would benefit our relationship with the landowner, the protections secured through these plans outweigh the protections that are likely through critical habitat designation, and exclusion of these

lands may provide an incentive for other landowners to seek similar voluntary conservation plans.

4. Areas With Economic Impacts. Areas where the conservation benefit to the species would be relatively low compared to the economic impacts.

In designating these critical habitats, NMFS organized information at scale of the 5th field HUC watershed because it corresponds to the spatial distribution and site fidelity scales of salmon and steelhead populations (Washington Department of Fisheries *et al.* 1992, McElhany *et al.* 2000). For earlier critical habitat designations for Snake River salmon and SONCC coho salmon, similar information was not available at the watershed scale, so NMFS used the scale of the 4th field HUC subbasin to organize critical habitat information. For southern green sturgeon, the CHRT identified and designated critical habitat as "specific areas" within freshwater rivers, the bypasses, the Sacramento-San Joaquin Delta, coastal bays and estuaries, and coastal marine areas (inshore of the 110-m depth contour).

NMFS reviews the status of designated critical habitat affected by the proposed action by examining the condition and trends of PCEs throughout the designated area. These PCEs vary slightly for some species, due to biological and administrative reasons, but all consist of site types and site attributes associated with life history events (Tables 21 – 24).

Table 21. PCEs of critical habitats designated for ESA-listed salmon and steelhead species considered in the opinion (except SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, and SONCC coho salmon), and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine areas	Forage Water quality	Adult growth and sexual maturation Adult spawning migration Subadult rearing

Table 22. PCEs of critical habitats designated for SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, SONCC coho salmon, and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site	**Site Attribute**	
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook, coho) Spawning gravel Water quality Water temp (sockeye) Water quantity	Adult spawning Embryo incubation Alevin growth and development Fry emergence from gravel Fry/parr/smolt growth and development
Adult and juvenile migration corridors	Cover/shelter Food (juvenile) Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Nearshore juvenile rearing Subadult rearing Adult growth and sexual maturation Adult spawning migration

Table 23. Primary constituent elements of critical habitats designated for eulachon and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater spawning and incubation	Flow, Water quality Water temperature Substrate	Adult spawning Incubation
Freshwater migration	Flow, Water quality Water temperature, Food	Adult and larval mobility Larval feeding
Nearshore and offshore marine areas	Food Water quality	Adult and juvenile growth, survival and maturation

Table 24. PCEs of critical habitat for southern green sturgeon and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	Site Attribute	
Freshwater riverine system	Food resources Migratory corridor Sediment quality Substrate type or size Water depth Water flow Water quality	Adult spawning Embryo incubation, growth and development Larval emergence, growth and development Juvenile metamorphosis, growth and development
Estuarine areas	Food resources Migratory corridor Sediment quality Water flow Water depth Water quality	Juvenile growth, development, seaward migration Subadult growth, development, seasonal holding, and movement between estuarine and marine areas Adult growth, development, seasonal holding, movements between estuarine and marine areas, upstream spawning movement, and seaward post-spawning movement
Coastal marine areas	Food resources Migratory corridor Water quality	Subadult growth and development, movement between estuarine and marine areas, and migration between marine areas Adult sexual maturation, growth and development, movements between estuarine and marine areas, migration between marine areas, and spawning migration

Climate change, as described in Section 2.2, is likely to reduce the conservation value of designated critical habitats in the Pacific Northwest. Other influences on the conservation value of critical habitats in the various recovery domains are discussed below.

Southern DPS Green Sturgeon. For freshwater rivers north of and including the Eel River, the areas upstream of the head of the tide were not considered part of the geographical area occupied by the southern DPS. However, the critical habitat designation recognizes not only the importance of natal habitats, but of habitats throughout their range. Critical habitat has been designated in coastal U.S. marine waters within 60 fathoms depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; the Lower Columbia River estuary; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor) and freshwater (USDC 2009). Table 21, above below delineates PCEs for Southern DPS green sturgeon.

The CHRT identified several activities that may threaten the PCEs in coastal bays and estuaries and may necessitate the need for special management considerations or protection. The application of pesticides may adversely affect prey resources and water quality within the bays and estuaries, as well as the growth and reproductive health of Southern DPS green sturgeon through bioaccumulation. Other activities of concern include those that may disturb bottom substrates, adversely affect prey resources, or degrade water quality through re-suspension of contaminated sediments. Of particular concern are activities that affect prey resources. Prey resources can be affected by: commercial shipping and activities generating point source pollution and non-point source pollution that can discharge contaminants and result in bioaccumulation of contaminants in green sturgeon; disposal of dredged materials that can bury prey resources; and bottom trawl fisheries that can disturb the bottom (but may result in beneficial or adverse effects on prey resources for green sturgeon). In addition, petroleum spills from commercial shipping activities and proposed alternative energy hydrokinetic projects may affect water quality or hinder the migration of green sturgeon along the coast (USDC 2009).

Eulachon. Critical habitat was designated for eulachon on October 20, 2011 (76 FR 65324).Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek have been designated. The mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles is also designated as critical habitat. The lateral extent of critical habitat is defined as the width of the stream channel defined by the ordinary high water line, as defined by the U.S. Army Corps of Engineers in 33 CFR 329.11.

The physical or biological features of freshwater spawning and incubation sites, include water flow, quality and temperature conditions and suitable substrate for spawning and incubation, as well as migratory access for adults and juveniles. These features are essential to conservation because without them the species cannot successfully spawn and produce offspring. The physical or biological features of freshwater migration corridors associated with spawning and incubation sites include water flow, quality and temperature conditions supporting larval and adult mobility, abundant prey items supporting larval feeding after the yolk sac is depleted, and free passage (no obstructions) for adults and juveniles. These features are essential to conservation because they allow adult fish to swim upstream to reach spawning areas and they allow larval fish to proceed downstream and reach the ocean.

WLC Recovery Domain. Critical habitat was designated in the WLC recovery domain for UWR spring-run Chinook salmon, LCR Chinook salmon, LCR steelhead, UWR steelhead, CR chum salmon, and southern green sturgeon, and proposed for eulachon. In addition to the Willamette and Columbia river mainstems, important tributaries on the Oregon side of the WLC include Youngs Bay, Big Creek, Clatskanie River, and Scappoose River in the Oregon Coast subbasin; Hood River in the Gorge; and the Sandy, Clackamas, Molalla, North and South Santiam, Calapooia, McKenzie, and Middle Fork Willamette rivers in the West Cascades subbasin.

Land management activities have severely degraded stream habitat conditions in the Willamette River mainstem above Willamette Falls and associated subbasins. In the Willamette River mainstem and lower sub-basin mainstem reaches, high density urban development and widespread agricultural effects have reduced aquatic and riparian habitat quality and complexity, and altered sediment and water quality and quantity, and watershed processes. The Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced rearing habitat by as much as 75%. In addition, the construction of 37 dams in the basin blocked access to more than 435 miles of stream and river spawning habitat. The dams alter the temperature regime of the Willamette

River and its tributaries, affecting the timing and development of naturally-spawned eggs and fry. Agriculture, urbanization, and gravel mining on the valley floor logging in the Cascade and Coast ranges contribute to increased erosion and sediment loads throughout the basin.

The mainstem Willamette River has been channelized and stripped of large wood. Development began to encroach on the riparian forest beginning in the 1870s (Sedell and Froggatt 1984). Gregory *et al.* (2002a) calculated that the total mainstem Willamette River channel area decreased from 41,000 to 23,000 acres between 1895 and 1995. They noted that the lower reach, from the mouth of the river to Newberg (River Mile (RM) 50), is confined within a basaltic trench, and that due to this geomorphic constraint, less channel area has been lost than in upstream areas. The middle reach from Newberg to Albany (RM 50 to 120) incurred losses of 12% primary channel area, 16% side channels, 33% alcoves, and 9% islands. Even greater changes occurred in the upper reach, from Albany to Eugene (RM 187). There, approximately 40% of both channel length and channel area were lost, along with 21% of the primary channel, 41% of side channels, 74% of alcoves, and 80% of island areas.

The banks of the Willamette River have more than 96 miles of revetments; approximately half were constructed by the Corps. Generally, the revetments were placed in the vicinity of roads or on the outside bank of river bends, so that while only 26% of the total length is revetted, 65% of the meander bends are revetted (Gregory *et al.* 2002b). The majority of dynamic sections have been armored, reducing adjustments in channel bed and sediment storage by the river, and thereby diminishing both the complexity and productivity of aquatic habitats (Gregory *et al.* 2002c).

Riparian forests have diminished considerably in the lower reaches of the Willamette River (Gregory *et al.* 2002d). Sedell and Froggatt (1984) noted that agriculture and cutting of streamside trees were major agents of change for riparian vegetation, along with snagging of large wood in the channel. The reduced shoreline, fewer and smaller snags, and reduced riparian forest comprise large functional losses to the river, reducing structural features, organic inputs from litter fall, entrained allochthonous materials, and flood flow filtering capacity. Extensive changes began before the major dams were built, with navigational and agricultural demands dominating the early use of the river. The once expansive forests of the Willamette River floodplain provided valuable nutrients and organic matter during flood pulses, food sources for macroinvertebrates, and slow-water refugia for fish during flood events. These forests also cooled river temperatures as the river flowed through its many channels.

Gregory *et al.* (2002d) described the changes in riparian vegetation in river reaches from the mouth to Newberg, from Newberg to Albany, and from Albany to Eugene. They noted that the riparian forests were formerly a mosaic of brush, marsh, and ash tree openings maintained by annual flood inundation. Below the City of Newberg, the most noticeable change was that conifers were almost eliminated. Above Newberg, the formerly hardwood-dominated riparian forests along with mixed forest made up less than half of the riparian vegetation by 1990, while agriculture dominated. This conversion has reduced river shading and the potential for recruitment of wood to the river, reducing channel complexity and the quality of rearing, migration and spawning habitats

Hyporheic flow in the Willamette River has been examined through discharge measurements and found to be significant in some areas, particularly those with gravel deposits (Wentz *et al.* 1998, Fernald *et al.* 2001). The loss of channel complexity and meandering that fosters creations of gravel deposits decreases the potential for hyporheic flows, as does gravel mining. Hyporheic flow processes water and affects its quality on reemerging into the main channel, stabilizing variations in physical and chemical water characteristics. Hyporheic flow is important for ecological functions, some aspects of water quality (such as temperature and dissolved oxygen), and some benthic invertebrate life stages. Alcove habitat, which has been limited by channelization, combines low hydraulic stress and high food availability with the potential for hyporheic flows across the steep hydraulic gradients in the gravel separating them from the main channel (Fernald *et al.* 2001).

On the mainstem of the Columbia River, hydropower projects, including the Federal Columbia River Hydropower System (FCRPS), have significantly degraded salmon and steelhead habitats (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, LCFRB 2010). The series of dams and reservoirs that make up the FCRPS block an estimated 12 million cubic yards of debris and sediment that would otherwise naturally flow down the Columbia River and replenish shorelines along the Washington and Oregon coasts.

Industrial harbor and port development are also significant influences on the Lower Willamette and Lower Columbia rivers (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, LCFRB 2010). Since 1878, 100 miles of river channel within the mainstem Columbia River, its estuary, and Oregon's Willamette River have been dredged as a navigation channel by the Corps. Originally dredged to a 20-foot minimum depth, the Federal navigation channel of the Lower Columbia River is now maintained at a depth of 43 feet and a width of 600 feet. The Lower Columbia River supports five ports on the Washington State side: Kalama, Longview, Skamania County, Woodland, and Vancouver. In addition to loss of riparian habitat, and disruption of benthic habitat due to dredging, high levels of several sediment chemicals, such as arsenic and polycyclic aromatic hydrocarbons (PAHs), have been identified in Lower Columbia River watersheds in the vicinity of the ports and associated industrial facilities.

The most extensive urban development in the Lower Columbia River subbasin has occurred in the Portland/Vancouver area. Outside of this major urban area, the majority of residences and businesses rely on septic systems. Common water quality issues with urban development and residential septic systems include higher water temperatures, lowered dissolved oxygen, increased fecal coliform bacteria, and increased chemicals associated with pesticides and urban runoff.

The Columbia River estuary has lost a significant amount of the tidal marsh and tidal swamp habitats that are critical to juvenile salmon and steelhead, particularly small or ocean-type species (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, LCFRB 2010). Edges of marsh areas provide sheltered habitats for juvenile salmon and steelhead where food, in the form of amphipods or other small invertebrates which feed on marsh detritus, is plentiful, and larger predatory fish can be avoided. Historically, floodwaters of the Columbia River inundated the margins and floodplains along the estuary, allowing juvenile salmon and steelhead access to a wide expanse of low-velocity marshland and tidal channel habitats. In general, the riverbanks were gently sloping, with riparian and wetland vegetation at the higher elevations of the river floodplain becoming habitat for salmon and steelhead during flooding river discharges or flood tides. Sherwood *et al.* (1990) estimated that the Columbia River estuary lost 20,000 acres of tidal swamps, 10,000 acres of tidal marshes, and 3,000 acres of tidal flats between 1870 and 1970. This study further estimated an 80% reduction in emergent vegetation production and a 15% decline in benthic algal production.

Habitat and food-web changes within the estuary, and other factors affecting salmon population structure and life histories, have altered the estuary's capacity to support juvenile salmon (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, LCFRB 2010). Diking and filling activities have reduced the tidal prism and eliminate emergent and forested wetlands and floodplain habitats. These changes likely have reduced the estuary's salmon-rearing capacity. Moreover, water and sediment in the Lower Columbia River and its tributaries have toxic contaminants that are harmful to fish and wildlife (LCREP 2007). Contaminants of concern include dioxins and furans, heavy metals, polychlorinated biphenyls (PCBs) and organochlorine pesticides such as DDT. Simplification of the population structure and life-history diversity of salmon possibly is yet another important factor affecting juvenile salmon viability. Restoration of estuarine habitats, particularly diked emergent and forested wetlands, reduction of avian predation by terns, and flow manipulations to restore historical flow patterns may have begun to enhance the estuary's productive capacity for salmon, although historical changes in population structure and salmon life histories may prevent salmon from making full use of the productive capacity of estuarine habitats.

The WLC Recovery Domain CHART determined that very few watersheds have PCEs in good to excellent condition (3), with no potential for additional improvement for salmon and/or steelhead. Only the upper McKenzie River and its tributaries were rated "3" with no potential for improvement for Chinook salmon PCEs. Most HUC5 watersheds are in fair-to-poor (score 1) or fair-to-good (score 2) condition. However, most watersheds with currently low or moderate habitat quality have some (score 1), or high (score 2), potential for improvement (Table 25).

Table 25. WLC Recovery Domain: Current and potential quality of watersheds identified as supporting historically independent populations of ESA- listed Chinook salmon (CK), chum salmon (CM), and steelhead (ST)(NOAA Fisheries 2005). Occupied watersheds within HUC4 watersheds are ranked primarily by "current quality" and secondly by their potential for restoration.

Geo-graphic Regions and HUC4s	Watershed Name(s) and HUC5 Code(s)	Listed Species	Current Quality	Potential Quality
Columbia Gorge #1707010xxx	Wind River (511)	CK/ST	2/2	2/2
	East Fork Hood (506), & Upper (404) & Lower Cispus (405) rivers	CK/ST	2/2	2/2
	Plympton Creek (306)	CK	2	2
	Little White Salmon River (510)	CK	2	0
	Grays Creek (512) & Eagle Creek (513)	CK/CM/ST	2/1/2	1/1/2
	White Salmon River (509)	CK/CM	2/1	1/2
	West Fork Hood River (507)	CK/ST	1/2	2/2
	Hood River (508)	CK/ST	1/1	2/2
	Unoccupied habitat: Wind River (511)	Chum conservation value "Possibly High"		
Cascade & Coast Range #1708000xxx	Lower Gorge Tributaries (107)	CK/CM/ST	2/2/2	2/3/2
	Lower Lewis (206) & North Fork Toutle (504) rivers	CK/CM/ST	1/3/1	2/1/2
	Salmon (101), Zigzag (102), & Upper Sandy (103) rivers	CK/ST	2/2	2/2
	Big Creek (602)	CK/CM	2/2	2/2
	Coweeman River (508)	CK/CM/ST	2/2/1	2/1/2
	Kalama River (301)	CK/CM/ST	1/2/2	2/1/2
	Cowlitz Headwaters (401)	CK/ST	2/2	1/1
	Skamokawa/Elochoman (305)	CK/CM	2/1	2
	Salmon Creek (109)	CK/CM/ST	1/2/1	2/3/2
	Green (505) & South Fork Toutle (506) rivers	CK/CM/ST	1/1/2	2/1/2
	Jackson Prairie (503) & East Willapa (507)	CK/CM/ST	1/2/1	1/1/2
	Grays Bay (603)	CK/CM	1/2	2/3
	Upper Middle Fork Willamette River (101)	CK	2	1
	Germany/Abernathy creeks (304)	CK/CM	1/2	2
	Mid-Sandy (104), Bull Run (105), & Lower Sandy (108) rivers	CK/ST	1/1	2/2
	Washougal (106) & East Fork Lewis (205) rivers	CK/CM/ST	1/1/1	2/1/2
	Upper Cowlitz (402) & Tilton rivers (501) & Cowlitz Valley Frontal (403)	CK/ST	1/1	2/1
	Clatskanie (303) & Young rivers (601)	CK	1	2
	Rifle Reservoir (502)	CK/ST	1	1
	Beaver Creek (302)	CK	0	1
	Unoccupied Habitat: Upper Lewis (201) & Muddy (202) rivers; Swift (203) & Yale (204) reservoirs	CK & ST Conservation Value "Possibly High"		
mette River #1709 000xx	Upper (401) & South Fork (403) McKenzie rivers; Horse Creek (402); & McKenzie River/Quartz Creek (405)	CK	3	3
	Lower McKenzie River (407)	CK	2	3

Geo-graphic Regions and HUC4s	Watershed Name(s) and HUC5 Code(s)	Listed Species	Current Quality	Potential Quality
	South Santiam River (606)	CK/ST	2/2	1/3
	South Santiam River/Foster Reservoir (607)	CK/ST	2/2	1/2
	North Fork of Middle Fork Willamette (106) & Blue (404) rivers	CK	2	1
	Upper South Yamhill River (801)	ST	2	1
	Little North Santiam River (505)	CK/ST	1/2	3/3
	Upper Molalla River (905)	CK/ST	1/2	1/1
	Abernethy Creek (704)	CK/ST	1/1	1/2
	Luckiamute River (306) & Yamhill (807) Lower Molalla (906) rivers; Middle (504) & Lower (506) North Santiam rivers; Hamilton Creek/South Santiam River (601); Wiley Creek (608); Mill Creek/Willamette River (701); & Willamette River/Chehalem Creek (703); Lower South (804) & North (806) Yamhill rivers; & Salt Creek/South Yamhill River (805)	CK/ST	1	1
	Hills (102) & Salmon (104) creeks; Salt Creek/Willamette River (103), Hills Creek Reservoir (105), Middle Fork Willamette/Lookout Point (107); Little Fall (108) & Fall (109) creeks; Lower Middle Fork of Willamette (110), Long Tom (301), Marys (305) & Mohawk (406) rivers	CK	1	1
	Willamina Creek (802) & Mill Creek/South Yamhill River (803)	ST	1	1
	Calapooia River (303); Oak (304) Crabtree (602), Thomas (603) & Rickreall (702) creeks; Abiqua (901), Butte (902) & Rock (903) creeks/Pudding River; & Senecal Creek/Mill Creek (904)	CK/ST	1/1	0/1
	Row River (201), Mosby (202) & Muddy (302) creeks, Upper (203) & Lower (205) Coast Fork Willamette River	CK	1	0
	Unoccupied habitat in North Santiam (501) & North Fork Breitenbush (502) rivers; Quartzville Creek (604) and Middle Santiam River (605)	CK & ST Conservation Value "Possibly High"		
	Unoccupied habitat in Detroit Reservoir/Blowout Divide Creek (503)	Conservation Value: CK "Possibly Medium"; ST Possibly High"		
Lower Willamette #1709001xxx	Collawash (101), Upper Clackamas (102), & Oak Grove Fork (103) Clackamas rivers	CK/ST	2/2	3/2
	Middle Clackamas River (104)	CK/ST	2/1	3/2
	Eagle Creek (105)	CK/ST	2/2	1/2
	Gales Creek (002)	ST	2	1
	Lower Clackamas River (106) & Scappoose Creek (202)	CK/ST	1	2
	Dairy (001) & Scoggins (003) creeks; Rock Creek/Tualatin River (004); & Tualatin River (005)	ST	1	1
	Johnson Creek (201)	CK/ST	0/1	2/2
	Lower Willamette/Columbia Slough (203)	CK/ST	0	2

IC Recovery Domain. Critical habitat has been designated in the IC recovery domain, which includes the Snake River basin, for SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, SR sockeye salmon, MCR steelhead, UCR steelhead, and SRB steelhead. Major tributaries in the Oregon portion of the IC recovery domain include the Deschutes, John Day, Umatilla, Walla Walla, Grande Ronde, and Imnaha rivers.

Habitat quality in tributary streams in the IC recovery domain varies from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural and urban development (Wissmar *et al.* 1994, NMFS 2009). Critical habitat throughout much of the IC recovery domain has been degraded by intense agriculture, alteration of stream morphology (*i.e.*, channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been severely affected by the development and operation of the FCRPS dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately owned dams in the Snake and Upper Columbia river basins. For example, construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho, including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good *et al.* 2005), and Grand Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River. Hydroelectric development modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adult and juveniles. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles.

Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have drastically altered hydrological cycles. A series of large regulating dams on the middle and upper Deschutes River affect flow and block access to upstream habitat, and have extirpated one or more populations from the Cascades Eastern Slope major population (IC-TRT 2003). Similarly, operation and maintenance of large water reclamation systems such as the Umatilla Basin and Yakima Projects have significantly reduced flows and degraded water quality and physical habitat in this domain.

Many stream reaches designated as critical habitat in the IC recovery domain are over-allocated under state water law, with more allocated water rights than existing streamflow conditions can support. Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence *et al.* 1996). Reduced tributary stream flow has been identified as a major limiting factor for all listed salmon and steelhead species in this area except SR fall-run Chinook salmon and SR sockeye salmon (NMFS 2007, NOAA Fisheries 2011).

Many stream reaches designated as critical habitat are listed on the state of Oregon's Clean Water Act section 303(d) list for water temperature. Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Contaminants such as insecticides and herbicides from agricultural runoff and heavy metals from mine waste are common in some areas of critical habitat.

The IC Recovery Domain is a very large and diverse area. The CHART determined that few watersheds have PCEs in good to excellent condition (score 3), with no potential for additional improvement for Chinook salmon and/or steelhead. In Washington, the Upper Methow, Lost White and Chiwawa watersheds were rated “3” for current and potential quality. In Oregon, only the Lower Deschutes, Minam, Wenaha, and Upper and Lower Imnaha Rivers HUC5 watersheds were rated “3” with no potential for improvement. In Idaho, a number of watersheds in the Upper Middle Salmon, Upper Salmon/Pahsimeroi, Middle Fork Salmon, Little Salmon, Selway, and Lochsa rivers were rated “3” for current and potential quality for steelhead PCEs. Additionally, several Lower Snake River HUC5 watersheds in the Hells Canyon area, straddling Oregon and Idaho, were highly rated. However, most HUC5 watersheds in the recovery domain are in fair-to-poor (score 1) or fair-to-good (score 2) condition. Most watersheds with currently low or moderate habitat quality have some (1), or high (2), potential for improvement (Table 26).

Table 26. Interior Columbia Recovery Domain: Current and potential quality of watersheds identified as supporting historically independent populations of ESA-listed Chinook salmon (CK) and steelhead (ST) (NOAA Fisheries 2005). Occupied watersheds within HUC4s are ranked primarily by "current quality" and secondly by their potential for restoration.

Geo-graphic Regions and HUC4s	Watershed Name and HUC5 Code(s)	Listed Species	Current Quality	Potential Quality
Upper Columbia # 1702000xxx	White (101), Chiwawa (102), Lost (801) & Upper Methow (802) rivers	CK/ST	3	3
	Upper Chewuch (803) & Twisp rivers (805)	CK/ST	3	2
	Lower Chewuch River (804); Middle (806) & Lower (807) Methow rivers	CK/ST	2	2
	Salmon Creek (603) & Okanogan River/Omak Creek (604)	ST	2	2
	Upper Columbia/Swamp Creek (505)	CK/ST	2	1
	Foster Creek (503) & Jordan/Tumwater (504)	CK/ST	1	1
	Upper (601) & Lower (602) Okanogan River; Okanogan River/Bonaparte Creek (605); Lower Similkameen River (704); & Lower Lake Chelan (903)	ST	1	1
	Unoccupied habitat in Sinlahekin Creek (703)	ST Conservation Value "Possibly High"		
Upper Columbia #1702001xxx	Entiat River (001); Nason/Tumwater (103); & Lower Wenatchee River (105)	CK/ST	2	2
	Lake Entiat (002)	CK/ST	2	1
	Columbia River/Lynch Coulee (003); Sand Hollow (004); Yakima/Hansen Creek (604), Middle Columbia/Priest Rapids (605), & Columbia River/Zintel Canyon (606)	ST	2	1
	Icicle/Chumstick (104)	CK/ST	1	2
	Lower Crab Creek (509)	ST	1	2
	Rattlesnake Creek (204)	ST	0	1
Yakima #1703000xxx	Upper (101) & Middle (102) Yakima rivers; Teanaway (103) & Little Naches (201) rivers; Naches River/Rattlesnake Creek (202); & Ahtanum (301) & Upper Toppenish (303) & Satus (305) creeks	ST	2	2
	Umtanum/Wenas (104); Naches River/Tieton River (203); Upper Lower Yakima River (302); & Lower Toppenish Creek (304)	ST	1	2
	Yakima River/Spring Creek (306)	ST	1	1
Lower Snake River #1706010xxx	Snake River/Granite (101), Getta (102), & Divide (104) creeks; Upper (201) & Lower (205) Imnaha River; Snake River/Rogersburg (301); Minam (505) & Wenaha (603) rivers	ST	3	3
	Grande Ronde River/Rondowa (601)	ST	3	2
	Big (203) & Little (204) Sheep creeks; Asotin River (302); Catherine Creek (405); Lostine River (502); Bear Creek (504); & Upper (706) & Lower (707) Tucannon River	ST	2	3
	Middle Imnaha River (202); Snake River/Captain John Creek (303); Upper Grande Ronde River (401); Meadow (402); Beaver (403); Indian (409), Lookingglass (410) & Cabin (411) creeks; Lower Wallowa River (506); Mud (602), Chesnimnus (604) & Upper Joseph (605) creeks	ST	2	2
	Ladd Creek (406); Phillips/Willow Creek (408); Upper (501) & Middle (503) Wallowa rivers; & Lower Grande Ronde	ST	1	3

Geo-graphic Regions and HUC4s	Watershed Name and HUC5 Code(s)	Listed Species	Current Quality	Potential Quality
	River/Menatche Creek (607)			
	Five Points (404); Lower Joseph (606) & Deadman (703) creeks	ST	1	2
	Tucannon/Alpowa Creek (701)	ST	1	1
	Mill Creek (407)	ST	0	3
	Pataha Creek (705)	ST	0	2
	Snake River/Steptoe Canyon (702) & Penawawa Creek (708)	ST	0	1
	Flat Creek (704) & Lower Palouse River (808)	ST	0	0
Upper Salmon & Pahsimeroi #1706020xxx	Germania (111) & Warm Springs (114) creeks; Lower Pahsimeroi River (201); Alturas Lake (120), Redfish Lake (121), Upper Valley (123) & West Fork Yankee (126) creeks	ST	3	3
	Basin Creek (124)	ST	3	2
	Salmon River/Challis (101); East Fork Salmon River/McDonald Creek (105); Herd Creek (108); Upper East Fork Salmon River (110); Salmon River/Big Casino (115), Fisher (117) & Fourth of July (118) creeks; Upper Salmon River (119); Valley Creek/Iron Creek (122); & Morgan Creek (132)	ST	2	3
	Salmon River/Bayhorse Creek (104); Salmon River/Slate Creek (113); Upper Yankee Fork (127) & Squaw Creek (128); Pahsimeroi River/Falls Creek (202)	ST	2	2
	Yankee Fork/Jordan Creek (125)	ST	1	3
	Salmon River/Kinnikinnick Creek (112); Garden Creek (129); Challis Creek/Mill Creek (130); & Patterson Creek (203)	ST	1	2
	Road Creek (107)	ST	1	1
	Unoccupied habitat in Hawley (410), Eighteenmile (411) & Big Timber (413) creeks	Conservation Value for ST "Possibly High"		
Middle Salmon, Panther & Lemhi #1706020xxx	Salmon River/Colson (301), Pine (303) & Moose (305) creeks; Indian (304) & Carmen (308) creeks, North Fork Salmon River (306); & Texas Creek (412)	ST	3	3
	Deep Creek (318)	ST	3	2
	Salmon River/Cow Creek (312) & Hat (313), Iron (314), Upper Panther (315), Moyer (316) & Woodtick (317) creeks; Lemhi River/Whimpey Creek (402); Hayden (414), Big Eight Mile (408), & Canyon (408) creeks	ST	2	3
	Salmon River/Tower (307) & Twelvemile (311) creeks; Lemhi River/Kenney Creek (403); Lemhi River/McDevitt (405), Lemhi River/Yearian Creek (406); & Peterson Creek (407)	ST	2	2
	Owl (302) & Napias (319) creeks	ST	2	1
	Salmon River/Jesse Creek (309); Panther Creek/Trail Creek (322); & Lemhi River/Bohannon Creek (401)	ST	1	3
	Salmon River/Williams Creek (310)	ST	1	2
	Agency Creek (404)	ST	1	1
	Panther Creek/Spring Creek (320) & Clear Creek (323)	ST	0	3
	Big Deer Creek (321)	ST	0	1
Fork, Lower, &	Lower (501), Upper (503) & Little (504) Loon creeks; Warm Springs (502); Rapid River (505); Middle Fork Salmon River/Soldier (507) & Lower Marble Creek (513); & Sulphur (509), Pistol (510), Indian (511) & Upper Marble (512) creeks; Lower Middle Fork Salmon	ST	3	3

Geo-graphic Regions and HUC4s	Watershed Name and HUC5 Code(s)	Listed Species	Current Quality	Potential Quality
	River (601); Wilson (602), Upper Camas (604), Rush (610), Monumental (611), Beaver (614), Big Ramey (615) & Lower Big (617) creeks; Middle Fork Salmon River/Brush (603) & Sheep (609) creeks; Big Creek/Little Marble (612); Crooked (616), Sheep (704), Bargamin (709), Sabe (711), Horse (714), Cottonwood (716) & Upper Chamberlain Creek (718); Salmon River/Hot Springs (712); Salmon River/Kitchen Creek (715); Lower Chamberlain/McCalla Creek (717); & Slate Creek (911)			
	Marsh (506); Bear Valley (508) Yellow Jacket (604); West Fork Camas (607) & Lower Camas (608) creeks; & Salmon River/Disappointment Creek (713) & White Bird Creek (908)	ST	2	3
	Upper Big Creek (613); Salmon River/Fall (701), California (703), Trout (708), Crooked (705) & Warren (719) creeks; Lower South Fork Salmon River (801); South Fork Salmon River/Cabin (809), Blackmare (810) & Fitsum (812) creeks; Lower Johnson Creek (805); & Lower (813), Middle (814) & Upper Secesh (815) rivers; Salmon River/China (901), Cottonwood (904), McKenzie (909), John Day (912) & Lake (913) creeks; Eagle (902), Deer (903), Skookumchuck (910), French (915) & Partridge (916) creeks	ST	2	2
	Wind River (702), Salmon River/Rabbit (706) & Rattlesnake (710) creeks; & Big Mallard Creek (707); Burnt Log (806), Upper Johnson (807) & Buckhorn (811) creeks; Salmon River/Deep (905), Hammer (907) & Van (914) creeks	ST	2	1
	Silver Creek (605)	ST	1	3
	Lower (803) & Upper (804) East Fork South Fork Salmon River; Rock (906) & Rice (917) creeks	ST	1	2
Little Salmon #176021xxx	Rapid River (005)	ST	3	3
	Hazard Creek (003	ST	3	2
	Boulder Creek (004)	ST	2	3
	Lower Little Salmon River (001) & Little Salmon River/Hard Creek (002)	ST	2	2
Selway, Lochsa & Clearwater #1706030xxx	Selway River/Pettibone (101) & Gardner (103) creeks; Bear (102), White Cap (104), Indian (105), Burnt Knob (107), Running (108) & Goat (109) creeks; & Upper Selway River (106); Gedney (202), Upper Three Links (204), Rhoda (205), North Fork Moose (207), Upper East Fork Moose (209) & Martin (210) creeks; Upper (211), Middle (212) & Lower Meadow (213) creeks; Selway River/Three Links Creek (203); & East Fork Moose Creek/Trout Creek (208); Fish (302), Storm (309), Warm Springs (311), Fish Lake (312), Boulder (313) & Old Man (314) creeks; Lochsa River/Stanley (303) & Squaw (304) creeks; Lower Crooked (305), Upper Crooked (306) & Brushy (307) forks; Lower (308), Upper (310) White Sands, Ten Mile (509) & John's (510) creeks	ST	3	3
	Selway River/Goddard Creek (201); O'Hara Creek (214) Newsome (505) creeks; American (506), Red (507) & Crooked (508) rivers	ST	2	3
	Lower Lochsa River (301); Middle Fork Clearwater River/Maggie Creek (401); South Fork Clearwater River/Meadow (502) & Leggett creeks; Mill (511), Big Bear (604), Upper Big Bear (605), Musselshell (617), Eldorado (619) & Mission (629) creeks, Potlatch	ST	2	2

Geo-graphic Regions and HUC4s	Watershed Name and HUC5 Code(s)	Listed Species	Current Quality	Potential Quality
	River/Pine Creek (606); & Upper Potlatch River (607); Lower (615), Middle (616) & Upper (618) Lolo creeks			
	South Fork Clearwater River/Peasley Creek (502)	ST	2	1
	Upper Orofino Creek (613)	ST	2	0
	Clear Creek (402)	ST	1	3
	Three Mile (512), Cottonwood (513), Big Canyon (610), Little Canyon (611) & Jim Ford (614) creeks; Potlatch River/Middle Potlatch Creek (603); Clearwater River/Bedrock (608), Jack's (609) Lower Lawyer (623), Middle Lawyer (624), Cottonwood (627) & Upper Lapwai (628) creeks; & Upper (630) & Lower (631) Sweetwater creeks	ST	1	2
	Lower Clearwater River (601) & Clearwater River/Lower Potlatch River (602), Fivemile Creek (620), Sixmile Creek (621) and Tom Taha (622) creeks	ST	1	1
Mid-Columbia #1707010xxx	Wood Gulch (112); Rock Creek (113); Upper Walla Walla (201), Upper Touchet (203), & Upper Umatilla (301) rivers; Meacham (302) & Birch (306) creeks; Upper (601) & Middle (602) Klickitat River	ST	2	2
	Glade (105) & Mill (202) creeks; Lower Klickitat River (604); Mosier Creek (505); White Salmon River (509); Middle Columbia/Grays Creek (512)	ST	2	1
	Little White Salmon River (510)	ST	2	0
	Middle Touchet River (204); McKay Creek (305); Little Klickitat River (603);Fifteenmile (502) & Fivemile (503) creeks	ST	1	2
	Alder (110) & Pine (111) creeks; Lower Touchet River (207), Cottonwood (208), Pine (209) & Dry (210) creeks; Lower Walla Walla River (211); Umatilla River/Mission Creek (303) Wildhorse Creek (304); Umatilla River/Alkali Canyon (307); Lower Butter Creek (310); Upper Middle Columbia/Hood (501); Middle Columbia/Mill Creek (504)	ST	1	1
	Stage Gulch (308) & Lower Umatilla River (313)	ST	0	1
John Day #170702xxx	Middle (103) & Lower (105) South Fork John Day rivers; Murderers (104) & Canyon (107) creeks; Upper John Day (106) & Upper North Fork John Day (201) rivers; & Desolation Creek (204)	ST	2	2
	North Fork John Day/Big Creek (203); Cottonwood Creek (209) & Lower NF John Day River (210)	ST	2	1
	Strawberry (108), Beech (109), Laycock (110), Fields (111), Mountain (113) & Rock (114) creeks; Upper Middle John Day River (112); Granite (202) & Wall (208) creeks; Upper (205) & Lower (206) Camas creeks; North Fork John Day/Potamus Creek (207); Upper Middle Fork John Day River (301) & Camp (302), Big (303) & Long (304) creeks; Bridge (403) & Upper Rock (411) creeks; & Pine Hollow (407)	ST	1	2
	John Day/Johnson Creek (115); Lower Middle Fork John Day River (305); Lower John Day River/Kahler Creek (401), Service (402) & Muddy (404) creeks; Lower John Day River/Clarno (405); Butte (406), Thirtymile (408) & Lower Rock (412) creeks; Lower John Day River/Ferry (409) & Scott (410) canyons; & Lower John Day River/McDonald Ferry (414)	ST	1	1

Geo-graphic Regions and HUC4s	Watershed Name and HUC5 Code(s)	Listed Species	Current Quality	Potential Quality
Deschutes #1707030xxx	Lower Deschutes River (612)	ST	3	3
	Middle Deschutes River (607)	ST	3	2
	Upper Deschutes River (603)	ST	2	1
	Mill Creek (605) & Warm Springs River (606)	ST	2	1
	Bakeoven (608) & Buck Hollow (611) creeks; Upper (701) & Lower (705) Trout Creek	ST	1	2
	Beaver (605) & Antelope (702) creeks	ST	1	1
	White River (610) & Mud Springs Creek (704)	ST	1	0
	Unoccupied habitat in Deschutes River/McKenzie Canyon (107) & Haystack (311); Squaw Creek (108); Lower Metolius River (110), Headwaters Deschutes River (601)	ST Conservation Value "Possibly High"		

OC Recovery Domain. In this recovery domain, critical habitat has been designated for OC coho salmon and southern DPS green sturgeon, and eulachon. Many large and small rivers supporting significant populations of coho salmon flow through this domain, including the Nehalem, Nestucca, Siletz, Yaquina, Alsea, Siuslaw, Umpqua, Coos, and Coquille.

The historical disturbance regime in the central Oregon Coast Range was dominated by a mixture of high and low-severity fires, with a natural rotation of approximately 271 years. Old-growth forest coverage in the Oregon Coast Range varied from 25 to 75% during the past 3,000 years, with a mean of 47%, and never fell below 5% (Wimberly *et al.* 2000). Currently, the Coast Range has approximately 5% old-growth, almost all of it on Federal lands. The dominant disturbance now is logging on a cycle of 30 to 100 years, with fires suppressed.

The state of Oregon (2005) completed an assessment of habitat conditions in the range of OC coho salmon in 2005. Oregon's assessment mapped how streams with high intrinsic potential for coho salmon rearing are distributed by land ownership categories. Agricultural lands and private industrial forests have by far the highest percentage of land ownership in high intrinsic potential areas and along all coho salmon stream miles. Federal lands have only about 20% of coho salmon stream miles and 10% of high intrinsic potential stream reaches. Because of this distribution, activities in lowland agricultural areas are particularly important to the conservation of OC coho salmon.

The OC coho salmon assessment concluded that at the scale of the entire domain, pools are generally abundant, although slow-water and off-channel habitat (which are important refugia for coho salmon during high winter flows) are limited in the majority of streams when compared to reference streams in minimally-disturbed areas. Amounts of large wood in streams are low in all four ODFW monitoring areas and land-use types relative to reference conditions. Amounts of fine sediment are high in three of the four monitoring areas, and were comparable to reference conditions only on public lands. Approximately 62 to 91% of tidal wetland acres (depending on estimation procedures) have been lost for functionally and potentially independent populations of coho salmon.

As part of the coastal coho salmon assessment, the Oregon Department of Environmental Quality analyzed the status and trends of water quality in the range of OC coho salmon using the Oregon water quality index, which is based on a combination of temperature, dissolved oxygen, biological oxygen demand, pH, total solids, nitrogen, total phosphates, and bacteria. Using the index at the species scale, 42% of monitored sites had excellent to good water quality, and 29% show poor to very poor water quality. Within the four monitoring areas, the North Coast had the best overall conditions (6 sites in excellent or good condition out of 9 sites), and the Mid-South coast had the poorest conditions (no excellent condition sites, and only 2 out of 8 sites in good condition). For the 10-year period monitored between 1992 and 2002, no sites showed a declining trend in water quality. The area with the most improving trends was the North Coast, where 66% of the sites (6 out of 9) had a significant improvement in index scores. The Umpqua River basin, with one out of 9 sites (11%) showing an improving trend, had the lowest number of improving sites.

SONCC Recovery Domain. Critical habitat in this recovery domain has been designated for SONCC coho salmon and southern DPS green sturgeon, and eulachon. Many large and small rivers supporting significant populations of coho salmon flow through this area, including the Elk, Rogue, Chetco, Smith and Klamath. The following summary of critical habitat information in the Elk, Rogue, and Chetco rivers is also applicable to habitat characteristics and limiting factors in other basins in this area.

The Elk River flows through Curry County, and drains approximately 92 square miles (or 58,678 acres) (Maguire 2001). Historical logging, mining, and road building have degraded stream and riparian habitats in the Elk River basin. Limiting factors identified for salmon and steelhead production in this basin include sparse riparian cover, especially in the lower reaches, excessive fine sediment, high water temperatures, and noxious weed invasions (Maguire 2001).

The Rogue River drains approximately 5,160 square miles within Curry, Jackson and Josephine counties in southwest Oregon. The mainstem is about 200 miles long and traverses the coastal mountain range into the Cascades. The Rogue River estuary has been modified from its historical condition. Jetties were built by the Corps in 1960, which stabilized and deepened the mouth of the river. A dike that extends from the south shore near Highway 101 to the south jetty was completed in 1973. This dike created a backwater for the large shallow area that existed here, which has been developed into a boat basin and marina, eliminating most of the tidal marsh. The quantity of estuary habitat is naturally limited in the Rogue River. The Rogue River has a drainage area of 5,160 square miles, but the estuary at 1,880 acres is one of the smallest in Oregon. Between 1960 and 1972, approximately 13 acres of intertidal and 14 acres of subtidal land were filled in to build the boat basin dike, the marina, north shore riprap and the other north shore developments (Hicks 2005). Jetties constructed in 1960 to stabilize the mouth of the river and prevent shoaling have altered the Rogue River, which historically formed a sill during summer months (Hicks 2005).

The Lower Rogue Watershed Council's watershed analysis (Hicks 2005) lists factors limiting fish production in tributaries to Lower Rogue River watershed. The list includes water temperatures, low stream flows, riparian forest conditions, fish passage and over-wintering habitat. Limiting factors identified for the Upper Rogue River basin include fish passage barriers, high water temperatures, insufficient water quantity, lack of large wood, low habitat complexity, and excessive fine sediment (Rogue Basin Coordinating Council 2006).

The Chetco River estuary has been significantly modified from its historical condition. Jetties were erected by the Corps in 1957, which stabilized and deepened the mouth of the river. These jetties have greatly altered the mouth of the Chetco River and how the estuary functions as habitat for salmon migrating to the ocean. A boat basin and marina were built in the late 1950s and eliminated most of the functional tidal marsh. The structures eliminated shallow water habitats and vegetation in favor of banks stabilized with riprap. Since then, nearly all remaining bank habitat in the estuary has been stabilized with riprap. The factors limiting fish production in the Chetco River appear to be high water temperature caused by lack of shade, especially in tributaries, high rates of sedimentation due to roads, poor over-wintering habitat due to a lack of large wood in tributaries and the mainstem, and poor quality estuary habitat (Maguire 2001).

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

As described above in the Status of the Species and Critical Habitats sections, factors that limit the recovery of salmon and steelhead vary with the overall condition of aquatic habitats on private, state, and Federal lands. Within the action area, many stream, estuarine and riparian areas have been degraded by the effects of land and water use, including road construction, forest management, agriculture, mining, urbanization, and water development. Each of these economic activities has contributed to a myriad of interrelated factors for the decline of salmon and steelhead. Among the most important of these are changes in stream channel morphology, degradation of spawning substrates, reduced instream roughness and cover, loss and degradation of estuarine rearing habitats, loss of wetlands, loss and degradation of riparian areas, water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants) degradation, blocked fish passage, direct take, and loss of habitat refugia.

Anadromous salmonids have been affected by the development and operation of dams. Dams, without adequate fish passage systems, have extirpated anadromous fish from their pre-development spawning and rearing habitats. Dams and reservoirs, within the currently accessible migratory corridor, have greatly altered the river environment and have affected fish passage. The operation of water storage projects has altered the natural hydrograph of many rivers. Water impoundment and dam operations also affect downstream water quality characteristics, vital components to anadromous fish survival. In recent years, high quality fish passage is being restored where it did not previously exist, either through improvements to existing fish passage facilities or through dam removal (*e.g.*, Marmot Dam on the Sandy River and Powerdale Dam on the Hood River).

Within the habitat currently accessible by salmon and steelhead, dams have negatively affected spawning and rearing habitat. Floodplains have been reduced, off-channel habitat features have been eliminated or disconnected from the main channel, and the amount of large woody debris in the mainstem has been greatly reduced. Remaining habitats often are affected by flow fluctuations associated with reservoir water management for power peaking, flood control, and other operations.

The development of hydropower and water storage projects within the Columbia River basin have resulted in the inundation of many mainstem spawning and shallow-water rearing areas (loss of spawning gravels and access to spawning and rearing areas); altered water quality (reduced spring turbidity levels), water quantity (seasonal changes in flows and consumptive losses resulting from use of stored water for agricultural, industrial, or municipal purposes), water temperature (including generally warmer minimum winter temperatures and cooler maximum summer temperatures), water velocity (reduced spring flows and increased cross-sectional areas of the river channel), food (alteration of food webs, including the type and availability of prey species), and safe passage (increased mortality rates of migrating juveniles) (Williams *et al*. 2005; Ferguson *et al*. 2005).

Salmon and steelhead are exposed to high rates of natural predation during all life stages. Fish, birds, and marine mammals, including harbor seals, sea lions, and killer whales all prey on juvenile and adult salmon. The Columbia River Basin has a diverse assemblage of native and introduced fish species, some of which prey on salmon and steelhead. The primary resident fish predators of salmonids in many areas of the State of Oregon inhabited by anadromous salmon are northern pikeminnow (native), smallmouth bass (introduced), and walleye (introduced). Other predatory resident fish include channel catfish (introduced), Pacific lamprey (native), yellow perch (introduced), largemouth bass (introduced), and bull trout (native).

Avian predation is another factor limiting salmonid recovery in the Columbia River Basin. Throughout the basin, piscivorous birds congregate near hydroelectric dams and in the estuary near man-made islands and structures. Avian predation has been exacerbated by environmental changes associated with river developments. Water clarity caused by suspended sediments settling in impoundments increases the vulnerability of migrating smolts. Delay in project reservoirs, particularly immediately upstream from the dams increases smolt exposure to avian predators, and juvenile bypass systems concentrate smolts, creating potential feeding stations for birds. Dredge spoil islands, associated with maintaining the Columbia River navigation channel, provide habitat for nesting Caspian terns and other piscivorous birds. Caspian terns, double-crested cormorants, glaucous-winged/western gull hybrids, California gulls, and ring-billed gulls are the principal avian predators in the basin

The environmental baseline also includes the anticipated impacts of all Federal actions in the action area that have already undergone formal consultation. For example, from 2001 through 2006, the Corps authorized 118 restoration actions in Oregon under programmatic consultations, and more than 800 other actions related to transportation features, over and in-water structures, and bank stabilization. The Corps, Bonneville Power Administration, and Bureau of Reclamation have also consulted on large water management actions, such as operation of the Federal Columbia River Power System, the Umatilla Basin Project, the Willamette River Project and the

Deschutes Project. The U.S. Forest Service and U.S. Bureau of Land Management consult on Federal land management throughout Oregon, including restoration actions, forest management, livestock grazing, and special use permits. Impacts to the environmental baseline from these previous actions vary from short-term adverse effects to long-term beneficial effects.

2.4 Effects of the Action on the Species and its Designated Critical Habitat

Under the administrative portion of this action, the Corps will evaluate each individual project to ensure that (a) the anticipated range of effects is within the range considered in this opinion; (b) the action is carried out consistent with the proposed design criteria; (c) project and program level monitoring and reporting requirements are met; and (d) the action will not occur in a Superfund Site designated by the U.S. Environmental Protection Agency, a state-designated clean-up area, or the likely impact zone of a significant contaminant source, as identified by historical information or the Corps' best professional judgment. Although that process will not, by itself, affect a listed species or critical habitat, it informs the effects analysis of the SLOPES IV program.

Construction of each project will begin after Corps approval. The direct physical and chemical effects of this part of the action on the environment will vary depending on the type of action being performed, but will all be based on a common set of effects related to construction.

Activities that are authorized using SLOPES and completed according to the proposed design criteria and the Reasonable and Prudent Measures and Terms and Conditions described in the Incidental Take Statement do not require further consultation. However, activities identified within the opinion as exclusions have a greater likelihood of adverse impacts to listed species and their habitats and require individual consultation.

Effects to the Environment. Each project proposed for authorization under this opinion requires one or more actions related to pre-construction, construction, operation and maintenance (including dredging), and restoration and mitigation, of a structure that is likely to adversely affect an ESA-listed species or a designated critical habitat. The direct physical and chemical effects of these activities typically begin with pre-construction activity, such as surveying, minor vegetation clearing, placement of stakes and flagging guides, and minor movements of machines and personnel over the action area. The next stage, site preparation, typically requires development of access roads, construction staging areas, and materials storage areas that affect more of the project area and clear vegetation that will allow rainfall to strike the bare land surface. Additional earthwork follows to clear, excavate, fill and shape the site for its eventual use removes still more vegetation and topsoil, exposes deeper soil layers, extends operations into the active channel, and reshapes banks as necessary for successful revegetation.

The set of effects associated with construction, operation or maintenance depends on the purpose and location of each type of structure and will be analyzed in subsequent sections. The final stage is site restoration and compensatory mitigation, if necessary, that consists of actions necessary to restore ecological recovery mechanisms and stimulate habitat forming processes, to maintain or promote the site along a trajectory toward conditions supporting functional aquatic habitats, such as soil stability, energy and nutrient distribution, channel fluvial geomorophology, and vegetation succession.

Pre-construction (Surveying). Pre-construction activity includes planning, design, permit acquisition, and surveying. Vegetation and fluvial geomorphic processes at a project site are providing for natural creation and maintenance of habitat function. Pre-construction activity that results in removal of that vegetation will reduce or eliminate those habitat values (Darnell 1976, Spence *et al.* 1996). Denuded areas lose organic matter and dissolved minerals, such as nitrates and phosphates. Microclimate can become drier and warmer with corresponding increases in wind speed, and soil and water temperature. Water tables and spring flow can be reduced. Loose soil can temporarily accumulate in the construction area. In dry weather, this soil can be dispersed as dust. In wet weather, loose soil is transported to streams by erosion and runoff, particularly in steep areas. Erosion and runoff increase the supply of soil to lowland drainage areas and eventually to aquatic habitats where they increase water turbidity and sedimentation.

During and after wet weather, increased runoff can suspend and transport more sediment to receiving waters. This increases turbidity and stream fertility. Increased runoff also increases the frequency and duration of high stream flows and wetland inundation in construction areas. Higher stream flows increase stream energy that can scour stream bottoms and transport greater sediment loads farther downstream that would otherwise occur. Sediments in the water column reduce light penetration, increase water temperature, and modify water chemistry. Once deposited, sediments can alter the distribution and abundance of important instream habitats, such as pool and riffle areas. During dry weather, the physical effects of increased runoff appear as reduced ground water storage, lowered stream flows, and lowered wetland water levels.

The combination of erosion and mineral loss can reduce soil quality and site fertility in upland and riparian areas. Concurrent in-water work can compact or dislodge channel sediments, thus increasing turbidity and allowing currents to transport sediment downstream where it is eventually redeposited. Continued operations when the construction site is inundated can significantly increase the likelihood of severe erosion and contamination.

Construction, Operation and Maintenance Activities. The effects of construction, operation, and maintenance activities are similar to those described above for pre-construction, but involve significantly more use of heavy equipment for vegetation removal and earthwork associated with access and materials staging. New impervious surfaces may allow for delivery of contaminants in stormwater runoff. Isolation of the work area may result in death due to handling stress.

Heavy equipment. Heavy equipment can compact soil, thus reducing soil permeability and infiltration. Use of heavy equipment also creates a risk that accidental spills of fuel, lubricants, hydraulic fluid, and similar contaminants may occur. Discharge of construction water used for vehicle washing, concrete washout, pumping for work area isolation, and other purposes can carry sediments and a variety of contaminants to the riparian area and stream.

Pilings. Pilings made of concrete, plastic, steel, or untreated wood are used in many construction projects in riparian and aquatic areas. Vibratory or impact hammers are commonly used to drive piles into the substrate. The choice of hammer type depends on pile material, substrate type, and other factors. Impact hammers can drive piles into most substrates, including hardpan and glacial till, while vibratory hammers are limited to softer, unconsolidated substrates. However, overwater structures must often meet seismic stability criteria. This requires that the supporting piles be attached to, or driven into, a hard substrate and this often means that at least some impact driving is necessary. Further, the bearing capacity of a pile driven with vibration is unknown unless an impact hammer is used to "proof" the pile by striking it pile several times to ensure it meets the designed bearing capacity. Temporary piles, fender piles, and some dolphin piles that do not need to be seismically stable can be driven with a vibratory hammer only, providing the pile type and sediments are appropriate.

Piles are removed using a vibratory hammer, direct pull, clam shell grab, or cutting/breaking the pile below the mudline. Vibratory pile removal causes sediments to slough off at the mudline, resulting in some suspension of sediments and, possibly, contaminants. Old and brittle piles may break under the vibrations and require use of another method. The direct pull method involves placing a choker around the pile and pulling upward with a crane or other equipment. When the piling is pulled from the substrate, sediments clinging to the piling slough off as it is raised through the water column, producing a plume of turbidity, contaminants, or both. The use of a clamshell may suspend additional sediment if it penetrates the substrate while grabbing the piling. If a piling breaks, the stub is often removed with a clam shell and crane. Sometimes, pilings are cut, broken, or driven below the mudline, and the buried section left in place. This may suspend small amounts of sediment, providing the stub is left in place and little digging is required to reach the pile. Direct pull or use of a clamshell to remove broken piles is likely to suspend more sediment and contaminants.

New Impervious Surfaces. Construction of pavement and other permanent soil coverings to build water-dependent structures (*e.g.*, bridges, boat ramps), roads linking those structures to the transportation system, and road upgrades can also reduce site permeability and infiltration. Permeability and infiltration are inversely related to the rate and volume of runoff. The effects of reduced soil permeability and infiltration are most significant in upland areas where runoff processes and the overall storm hydrograph are controlled mainly by groundwater recharge and subsurface flows. These effects are less significant in riparian areas, where saturated soils and high water tables are more common and runoff processes are dominated by direct precipitation and overland flow (Dunne and Leopold 1978).

Stormwater runoff from roads, bridges, and parking lots delivers a wide variety of pollutants to aquatic ecosystems, such as nutrients, metals (copper and zinc in particular), petroleum-related compounds, sediment washed off the road surface, and agricultural chemicals used in road maintenance (Driscoll *et al.* 1990; Buckler and Granato 1999, Colman *et al.* 2001, Kayhanian *et al.* 2003).

In-Water Work. Although the most lethal biological effects of the proposed actions on individual listed species will likely be caused by the isolation of in-water areas, lethal and sublethal effects would be greater than without isolation. In-water work area isolation is itself a conservation measure intended to reduce the adverse effects of erosion and runoff on the population. Any individual fish present in the work isolation area will be captured and released.

Dredging to maintain access and functionality. Dredging will occur to remove sediments necessary to maintain access to existing docks, marinas, port terminals, industrial docks and wharfs, and water diversions. Dredging and disposal of the dredged material speed up the natural processes of sediment erosion, transportation, and deposition (Morton 1977). Dredging and disposal temporarily increases turbidity, changes bottom topography with resultant changes in water circulation, and changes the mechanical properties of the sediment at the dredge and disposal sites (Morton 1977). The effects of turbidity on salmonids are discussed below. These effects are significant in proportion to the ratio of the size of the dredged area to the size of the bottom area and water volume (Morton 1977).

In all areas covered by this consultation, resuspension of toxic sediments may be a problem. Adequate testing of sediments prior to dredging to limit resuspension of toxic materials is necessary. Many areas within the action area have substantial contaminated sediments. The Corps and resource agencies have developed a methodology/protocol to analyze sediments for toxicity and suitability for in-water disposal (USACE *et al.* 2009). Sediment testing results should be submitted to NMFS with the Project Implementation Form for review.

Extraction of bed material with upland disposal causes bed degradation (NMFS 2005b). Gravel extraction sites trap incoming bedload sediment, passing 'hungry water' downstream, which typically erodes the channel bed and banks to regain at least part of its sediment load (Kondolf 1997). Gravel removal may cause downstream erosion if the area subsequently receives less bed material from upstream than is being carried away by fluvial transport. Thus, gravel removal not only impacts the extraction site, but also reduces gravel delivery to downstream areas. In some areas there are sufficient amounts of material being delivered that upland disposal is not problematic. The requirement to dispose of the material within the stream/river will prevent this from happening.

Site Preparation for Construction of Buildings and Related Features**.** The proposed action may include site preparation for construction of buildings and related features outside of the riparian management area. Most direct and indirect effects of this type of site preparation are the same as those for general construction discussed above, and these site preparation actions will follow the conservation measures for general construction as applicable.

Overwater Structures. Overwater structures include recreational boating facilities and dock and wharf facilities operated by ports and other commercial entities. Recreational boating requires construction and maintenance of a variety of types and sizes of structures. Some are water dependent, and will be placed in riparian, nearshore, and overwater areas. Others are "related facilities" (*e.g.*, parking lots, picnic areas), that are not water dependent. For purposes of this consultation, actions proposed to support recreational boating facilities are construction of boat ramps; construction of a residential pier, ramp and float; maintenance, repair and relocation of structures within an existing marina; structures in fleeting and anchorage areas; installation of small temporary floats; and repair of navigational aids.

Commercial dock and wharf facilities also entail many different types and sizes of structures, often installed and operated over large areas. For purposes of this consultation, however, the proposed action includes the following work: (1) Replacement of existing pilings, fender piles, group pilings, walers, and fender pads; (2) installation of new mooring dolphins and structural pilings; (3) height extension of existing pilings; and (4) recycling of large wood obstructions that limit the usefulness of dock and wharf facilities.

Predation. Predation has been identified as one of the limiting factors for all salmonid species in the Columbia River basin (except chum salmon) (NMFS 2008b). Increased predator abundance may result from climate change (ISAB 2007). The ISAB recommend reducing predation by introduced piscivorous species to mitigate these anticipated effects. Predator species such as northern pikeminnow (*Ptychocheilus oregonensis*), and introduced predators such as largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), black crappie (*Pomoxis nigromaculatus*) white crappie (*P. annularis*) and, potentially, walleye (*Stizostedion vitreum*) (Ward *et al.* 1994, Poe *et al.* 1991, Beamesderfer and Rieman 1991, Rieman and Beamesderfer 1991, Pflug and Pauley 1984, and Collis *et al.* 1995) may use habitat created by overwater structures (Ward and Nigro 1992, Pflug and Pauley 1984) such as piers, float houses, floats and docks (Phillips 1990). Carrasquero (2001), in reviewing the literature regarding impacts of overwater structures, reports that smallmouth and largemouth bass have a strong affinity to structures; forage and spawn in the vicinity of docks, piers and pilings; and, largemouth and smallmouth bass are common predators of juvenile salmonids.

Major habitat types used by largemouth bass include vegetated areas, open water and areas with cover such as docks and submerged trees (Mesing and Wicker 1986). During the summer, bass prefer pilings, rock formations, areas beneath moored boats, and alongside docks. Colle *et al.* (1989) found that, in lakes lacking vegetation, largemouth bass distinctly preferred habitat associated with piers, a situation analogous to slack water areas of the Columbia River. Marinas also provide wintering habitat for largemouth bass out of mainstem current velocities (Raibley *et al.* 1997). Wanjala *et al.* (1986) found that adult largemouth bass in a lake were generally found near submerged structures suitable for ambush feeding. Bevelhimer (1996), in studies on smallmouth bass, indicates that ambush cover and low light intensities create a predation advantage for predators and can also increase foraging efficiency.

Pribyl *et al.* (2005), in studies on piscivorous fish in the Lower Willamette River found that smallmouth bass were the most prevalent species captured. They found that smallmouth bass were found near beaches and rock outcrops more frequently in the winter and spring, and highly associated with pilings regardless of the season. For largemouth bass, they found that they were found near pilings and beach sites in summer and autumn and near pilings, rock and beach areas during winter and spring. They also indicated that large sized predators were present at very low densities, but juveniles were fairly abundant. Smallmouth densities were highest in riprap, mixed riprap/beach and rock outcrop areas. Largemouth bass densities were low throughout the year, with riprap sites and alcoves being the highest density areas. Zimmerman (1999) and Sauter *et al*. (2004) both indicate that wild fall Chinook are the most vulnerable to smallmouth predation due to their smaller size during emigration.

Black crappie and white crappie are known to prey on juvenile salmonids (Ward *et al.* 1991). Ward *et al.* (1991), in their studies of crappies within the Willamette River, found that the highest density of crappies at their sampling sites occurred at a wharf supported by closely spaced pilings. They further indicated that suitable habitat for crappies includes pilings and riprap areas. Walters *et al.* (1991) also found that crappie were attracted to overwater structures.

Ward (1992) found that stomachs of northern pikeminnow in developed areas of Portland Harbor contained 30% more salmonids than those in undeveloped areas, although undeveloped areas contained more northern pikeminnow. Pribyl *et al.* (2005) found no fish in the stomachs of pikeminnow, but did find fish remains in the stomachs of smallmouth bass.

There are four major predatory strategies used by piscivorous fish: They run down prey; ambush prey; habituate prey to a non-aggressive illusion; or stalk prey (Hobson 1979). Ambush predation is probably the most common strategy. Predators lie in wait, then dart out at the prey in an explosive rush (Gerking 1994). Predators may use sheltered areas that provide slack water to ambush prey fish in faster currents (Bell 1991).

Light plays an important role in defense from predation. Prey species are better able to see predators under high light intensity, thus providing the prey species with an advantage (Hobson 1979, Helfman 1981). Petersen and Gadomski (1994) found that predator success was higher at lower light intensities. Prey fish lose their ability to school at low light intensities, making them vulnerable to predation (Petersen and Gadomski 1994). Howick and O'Brien (1983) found that in high light intensities prey species (bluegill) can locate largemouth bass before they are seen by the bass. However, in low light intensities, the bass can locate the prey before they are seen. Walters *et al.* (1991) indicate that high light intensities may result in increased use of shade-producing structures. Helfman (1981) found that shade, in conjunction with water clarity, sunlight and vision, is a factor in attraction of temperate lake fishes to overhead structure.

The above analysis pertains to predator species that occupy freshwater areas covered by this opinion. Within estuarine areas, while there is some piscivorous predation by saltwater species, these predatory species do not utilize structures as described above.

In addition to piscivorous predation, overwater structures (tops of pilings) also provide perching platforms for avian predators such as double-crested cormorants (*Phalacrocorax auritis*), from which they can launch feeding forays or dry plumage. Krohn *et al.* (1995) indicate that cormorants can reduce fish populations in forage areas, thus possibly affecting adult returns as a result of smolt consumption. Because their plumage becomes wet when diving, cormorants spend considerable time drying out feathers (Harrison 1983) on pilings and other structures near feeding grounds (Harrison 1984).

Boating. The placement of a boat ramp will generally result in permanent loss of some riparian habitat. The extent of area of that loss associated with a ramp is usually small. The majority of ramps are one or two lanes, each roughly 15' wide, extending from the top of bank to up to 10' below the water line. Upland parking lots, picnic areas, walking trails, and toilet facilities will also result in losses to riparian vegetation if placed close to the water's edge. In addition, construction activities associated with ramp construction will also result in impacts to the riparian area. These effects can be offset with compensatory mitigation. The proposed use of hard scour protection is limited to preventing scouring at a boat ramp. Direct and indirect effects of these scour protection actions are similar to the effects of general construction discussed above, including production of new impervious surface.

The indirect effects of scour protection for public infrastructures are similar, with the area occupied by the hard structure itself being analogous to an area of new impervious surface. However, this effect will be offset with the requirement of offset with additional planting of riparian trees and shrubs or restoration of nearshore habitats.

Riparian habitats are one of the most ecologically productive and diverse terrestrial environments (Kondolf *et al.* 1996, Naiman *et al.* 1993). Vegetation in riparian areas influences channel processes through stabilizing bank lines, and providing large wood terrestrial food sources rather than autochthonous food production, and regulating light and temperature regimes (Kondolf *et al.* 1996, Naiman *et al.* 1993). Revegetation of any riparian areas disturbed by construction activities in time is likely to maintain or improve habitat conditions for salmonids within the action area by increasing plant densities in degraded areas or changing plant species at the site to those that are more beneficial to aquatic species.

Many direct and indirect effects of recreational boating activities are similar to those of general construction described above. Among those are construction of new impervious surfaces for a boat ramp or other water-dependent structure that will be offset by an action like planting additional riparian trees and shrubs or restoration of nearshore habitats. Other direct physical and chemical effects are unique to overwater structures. These are disruption of nearshore habitat, shading and ambient light changes, water flow pattern, and energy disruption (Carrasquero 2001), although these effects have been avoided or minimized by conservation measures described above. Overwater structures can alter predator prey relationships by improving predator success (Hobson 1979, Bell 1991, Metcalfe *et al.* 1997), although the environmental conditions created by overwater structures that can increase predation on salmon can be avoided or minimized using project design criteria that reduce shaded area and avoid placement in shallow water and other low velocity locations (Carrasquero 2001).

The obvious indirect effects of recreational boating facilities are those associated with boating activities. Boating can result in discharges of many pollutants from boats and related facilities, and physical disruption to wetland, riparian and benthic communities and ecosystems through the actions of a boat hull, propeller, anchor, or wakes (USEPA 1993, Carrasquero 2001, Kahler *et al.* 2000, Mosisch and Arthington 1998). Boats may interact with the aquatic environment by a variety of mechanisms, including emissions and exhaust, propeller contact, turbulence from the propulsion system, waves produced by movement, noise, and movement itself (Asplund 2000). Sediment resuspension, water pollution, disturbance of fish and wildlife, destruction of aquatic plants, and shoreline erosion are the major areas of concern (Asplund 2000).

Wakes derived from boat traffic may also increase turbidity in shallow waters, uproot aquatic macrophytes in shallow waters, or cause pollution through exhaust, fuel spills, or release of petroleum lubricants (Warrington 1999b, McConchie and Tolman 2003). Hilton and Phillips (1982) in their studies on boat traffic and increased turbidity in the River Ant determined that boat traffic definitely had a large effect on turbidity levels in the river. Nordstrom (1989) says that boat wakes may also play a significant role in creating erosion in narrow creeks entering an estuary (areas extensively used by rearing juvenile salmonids). Kahler *et al.* (2000) indicates that wake erosion results in continuous low level sediment input with episodic large inputs from bank failure.

Dorava (1999) indicates that boat wake erosion was the cause of substantial bank erosion on the Kenaii River, Alaska (whose primary traffic is 10- to 26-foot-long recreational boats) and the reason for substantial bank stabilization measures to arrest that erosion. The result of the erosion in important salmon areas is a reduction in numbers of salmon (Dorava 1999). Dorava (1999) further indicates that juvenile Chinook salmon rearing habitat features are easily altered by boat wake induced streambank erosion and streamside development.

McConchie and Toleman (2003) in their studies on the Waikato River found that effects from boat wakes are site specific and dependent on bank vegetation, bed and bank material, availability of sediment, channel profile, water depth and vessel speed. They further found that boat generated wakes have a greater potential effect where the river channel is narrow and where boat use is regular, concentrated and close to shore, and also in systems where systems are regulated and not subject to high erosive flows.

Klein (1997), citing several EPA studies, indicates that boat traffic in waters less than 8.2 feet in depth result in substantial impacts to submerged vegetation and benthic communities. Klein (1997) also indicates that sediment resuspension is substantial if a boat operates in less than 7.2 feet of water and that a slight increase in depth would prevent the resuspension of sediment. Asplund (2000) evaluated the literature on boating effects to the aquatic environment and found that impacts were few in waters greater than 10 feet. Limiting the placement of structures to areas where any moored boats are in waters deeper than 10 feet (as measured at OLW) would minimize any resuspension and submerged vegetation impacts.

Bauer *et al.* (2002) developed algorithms to predict erosion rates from boat traffic. They verified their models by using data measured during a field experiment in which a 7.5 m (24.6 feet) boat was driven past the site over a range of speeds to generate waves of varying size in a levee bank in the Sacramento–San Joaquin River Delta. Based on their test findings, erosion rates averaged about 0.01 to 0.03 mm/boat passage. The models predicted erosion estimates from their two models were similar, and ranged from less than 0.01 mm/boat passage for the weakest boat-wake event to 0.22 mm for the most energetic boat-wake event. They judged that the uppermost values overestimate the true erosion rate associated with single boat passages. However, two multiple boat-passage experiments yielded erosion rates of roughly 0.01–0.03 mm/boat passage, which agree with the lower estimates from the analytical methods.

In many areas of the state shoreline habitat is relatively untouched. In those areas, increased boating activity could result in substantial erosion and disruption of aquatic vegetation. In areas where there has been substantial revetments and riprap placement an increase in boating activity would not have as big an impact. The requirement for NMFS review and approval of the project will allow for onsite evaluation as to the appropriateness of the activity.

Aquatic vegetation. Estuarine and shallow nearshore, tidal marsh habitats fulfill fish and wildlife needs for reproduction, feeding, refuge, and other physiological necessities

(Simenstad *et al.* 1991, Good 1987, Phillips 1984). Estuaries serve as rearing grounds and food sources and provide a transitional area for salmonids moving from fresh to salt water and vice-versa (Botkin *et al.* 1995). Estuaries also play a key role in regulating overall survival and abundance (Williams *et al.* 1996). Changes in estuarine food webs may constrain salmon production (Williams *et al.* 1996). Botkin *et al.* (1995) stated: "Without the rich supporting wetland areas highly valuable to most if not all salmon species, the crucial transition of salmon smolts to oceanic life would be jeopardized."

Coastal fish populations also depend upon both the quantity and quality of the available estuarine and tidal marsh habitats (Peters and Cross 1992). Most marine and intertidal waters, wetlands, swamps and marshes are critical to fish (Fedler and Crookshank 1992). For example, seagrass beds protect young fish from predators, provide habitat for fish and wildlife, improve water quality, and control sediments (Lockwood 1990, Thayer *et al.* 1984, Hoss and Thayer 1993, Phillips 1984). In addition, seagrass beds are critical to nearshore food web dynamics (Wyllie-Echeverria and Phillips 1994). For example, some invertebrates that are principal prey items for fish of commercial and ecological importance (*e.g.*, chum salmon, Pacific herring, Pacific sand lance) in the Pacific Northwest only occur in eelgrass beds (Simenstad *et al.* 1982, Simenstad 1994).

Seagrass beds are among the areas of highest primary productivity in the world (Ferguson *et al.* 1980, Emmett *et al.* 1991, Hoss and Thayer 1993, Herke and Rogers 1993). This primary production, combined with other nutrients, provide high rates of secondary production in fish (Good 1987, Sogard and Able 1991, Emmett *et al.* 1991, Herke and Rogers 1993).

Salmon have evolved several life-history strategies for using estuaries (Williams *et al.* 1996). Four anadromous fish species (pink, chum, coho, and Chinook salmon) are found in association with eelgrass meadows (Phillips 1984). Coho, yearling Chinook, and sockeye salmon spend little time in the estuary; pink salmon traverse through the estuary relatively quickly; and chum and subyearling Chinook salmon use the estuary quite extensively (Pearcy 1992, Fisher and Pearcy 1996). Pearcy (1992) states that chum salmon in Netarts Bay, Oregon use shallow marshes, sloughs, and tidal creeks in the upper reaches extensively during high tides in the spring. During low tides they move into deep water channels. As the fish grow in size, they begin to use the lower portions of the estuary.

The exact times when juvenile salmonids enter the estuary and how long they stay depends on factors such as stream temperatures, fry size and condition, food resources, stream discharge and turbidity, tidal cycles, and photoperiod (Simenstad *et al.* 1982). Simenstad *et al.* (1997), in their monitoring studies of an "engineered" slough, found that coho salmon use these areas as rearing habitat. The National Research Council (1996) states, "loss of estuarine and riverine habitat can potentially affect all salmon."

Fox (1992) states: "The ability of habitats to support high productivity levels of marine resources is diminishing, while pressures for their conversion to other uses are continuing." Point and non-point discharges, waste dumps, eutrophication, acid rain, and other human impacts reduce this ability (Fox 1992). Population growth and demands for international business trade along the Pacific Rim exert pressure to expand coastal towns and port facilities - resulting in net estuary losses (Kagan 1991, Fawcett and Marcus 1991). Carefoot (1977), discussing Pacific seashores, states: "Estuaries are complex systems which can succumb to humankind's massive and pervasive assaults."

Activities that are likely to result in direct long-term adverse effects to estuarine and tidal marsh functions are those that will cause permanent coverage of estuarine and tidal marsh areas by the footprint of new water-dependent structures and the reduction of benthic invertebrates caused by maintenance dredging. Indirect, long-term effects may be caused by vessel wakes and propeller washing due to recreational boat operations above seagrass beds (Peterson *et al.* 1987, Lockwood 1990, Fonseca *et al.* 1998). Mooring boats in or next to seagrass beds can also cause similar damage. These effects will be avoided or minimized by not constructing new facilities in areas containing aquatic vegetation.

Site Restoration and Compensatory Mitigation. The direct physical and chemical effects of post-construction site restoration included as part of the proposed actions are essentially the reverse of the construction activities that go before it. Bare earth is protected by seeding, planting woody shrubs and trees, and mulching. This immediately dissipates erosive energy associated with precipitation and increases soil infiltration. It also accelerates vegetative succession necessary to restore the delivery of large wood to the riparian area and stream, root strength necessary for slope and bank stability, leaf and other particulate organic matter input, sediment filtering and nutrient absorption from runoff, and shade. Microclimate will become cooler and moister, and wind speed will decrease. When projects result in a net loss of functional aquatic habitat after construction and site restoration is complete, off-site compensatory mitigation similar to site restoration is required and will have similar effects to those discussed above.

The primary proposed streambank restoration as part of the action is the use of large wood and vegetation to increase bank strength and resistance to erosion in an ecological approach to engineering streambank stabilization (Mitsch 1996; WDFW *et al.* 2003). The proposed actions explicitly do not include any other type of structure built entirely of rock, concrete, steel or similar materials, other streamflow control structures, or any type of channel-spanning structure. The primary means of streambank stabilization proposed is the use of large wood and vegetation to increase resistance to bank erosion (bioengineering). This approach protects banks by using natural materials to increase erosion resistance and bank roughness to disrupt stream energy. Roots and other small and large pieces of vegetation are used to collect and bind bank sediments. This helps to avoid or minimize loss of riparian function associated with more traditional approaches to streambank stabilization that rely primarily on rock, cement, steel, and other hard materials. Bioengineered bank treatments develop root systems that are flexible and regenerative, and respond more favorably to hydraulic disturbance than conventional hard alternatives.

2.4.1 Effects on ESA-Listed Salmon and Steelhead

The biological effects included as part of the proposed action are primarily the result of physical and chemical changes in the environment caused by activities authorized under the SLOPES IV program, but also include subsequent operation and maintenance activities. These effects are complex and vary in magnitude and severity between the individual organism, population, ESU/DPS, and community scales.

Preconstruction. Preconstruction activities may result in increased turbidity and suspended sediment. Turbidity may have beneficial or detrimental effects on fish, depending on the intensity, duration and frequency of exposure (Newcombe and MacDonald 1991). Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such high pulse exposures. Adult and larger juvenile salmonids may be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjorn and Reiser 1991), although these events may produce behavioral effects, such as gill flaring and feeding changes (Berg and Northcote 1985).

Deposition of fine sediments reduces incubation success (Bell 1991), interferes with primary and secondary productivity (Spence *et al.* 1996), and degrades cover for juvenile salmonids (Bjornn and Reiser 1991). Chronic, moderate turbidity can harm newly-emerged salmonid fry, juveniles, and even adults by causing physiological stress that reduces feeding and growth and increases basal metabolic requirements (Redding *et al.* 1987, Lloyd 1987, Bjornn and Reiser 1991, Servizi and Martens 1991, Spence *et al.* 1996). Juveniles avoid chronically turbid streams, such as glacial streams or those disturbed by human activities, unless those streams must be traversed along a migration route (Lloyd *et al.* 1987). Older salmonids typically move laterally and downstream to avoid turbid plumes (McLeay *et al.* 1984, 1987, Sigler *et al.* 1984, Lloyd 1987, Scannell 1988, Servizi and Martens 1991). On the other hand, predation on salmonids may be reduced in waters with turbidity equivalent to 23 Nephalometric Turbidity Units (NTU) (Gregory 1993, Gregory and Levings 1998), an effect that may improve overall survival.

Construction, Operation and Maintenance Activities. Construction actions may also have direct biological effects on individual salmon and steelhead by altering development, bioenergetics, growth, and behavior. Actions that increase flows can disturb gravel in salmon or steelhead redds and can also agitate or dislodge developing young, causing their damage or loss. Similarly, actions that result in water quality changes can result in altered behavior and death. Actions that reduce subsurface or surface flows, reduce shade, deposit silt in streams, or otherwise reduce the velocity, temperature, or oxygen concentration of surface water as it cycles through a redd can adversely affect the survival, timing, and size of emerging fry (Warren 1971). Salmon that survive incubation in the redd, but emerge later and smaller than other fry also appear to be weaker, less dominant, and less capable of maintaining their position in the environment (Mason and Chapman 1965). Once adult salmon or steelhead arrive at a spawning area, their successful reproduction is dependent on the same environmental conditions that affect survival of embryos in the redd. Environmental conditions in estuarine areas with native submerged aquatic vegetation, in particular, are important to all species of salmon and to estuarine fishes.

Heavy equipment. Heavy equipment used instream in spawning areas may disturb or compact gravel and other channel materials, thus making it harder for fish to excavate redds, and decreasing redd aeration. Cederholm *et al.* (1997) recommend that heavy equipment work should be performed from the bank and that work within bedrock or boulder/cobble bedded channels should be viewed as a last resort and that least impacting equipment such as spider harvesters/log loaders be used. Heavy equipment or material used instream in any occupied habitat may inhibit fish passage or kill or injure individual fish.

Pilings. Turbidity generated from pile driving or removal is temporary and confined to the area close to the operation. NMFS expects that some individual Chinook salmon and steelhead, both adult and juvenile, may be harassed by turbidity plumes resulting from pile driving or removal. Indirect lethal take can occur if individual juvenile fish are preyed on when the leave the work area to avoid temporary turbidity plumes. The proposed requirements for completing the work during the preferred in-water work window will minimize the effects of turbidity on listed species.

Benthic invertebrates in shallow-water habitats are key food sources for juvenile salmonids during their out migration. New pilings may reduce the substrate available to benthic aquatic organisms and, therefore, the food available for juvenile salmonids in the project area. NMFS believes that some effect on salmon and steelhead productivity may occur due to suppression of benthic prey species. Most existing commercial dock structures have a high density of existing piles and are not likely to provide significant habitat for listed salmonids. Further, listed salmonids must migrate by such structures. This likely takes place in an area of diminished light intensity and deeper water along the outer margin of the structure, where they may have higher predation.

Pile driving often generates intense sound pressure waves that can injure or kill fish (Reyff 2003, Abbott and Bing-Sawyer 2002, Caltrans 2001, Longmuir and Lively 2001, Stotz and Colby 2001). The type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water, and the type and size of the pile-driving hammer all influence the sounds produced during pile driving. Fishes with swimbladders (including salmon and steelhead) are sensitive to underwater impulsive sounds, *i.e.*, sounds with a sharp sound pressure peak occurring in a short interval of time, (Caltrans 2001). As the pressure wave passes through a fish, the swimbladder is rapidly squeezed due to the high pressure, and then rapidly expanded as the under pressure component of the wave passes through the fish. The pneumatic pounding may rupture capillaries in the internal organs as indicated by observed blood in the abdominal cavity, and maceration of the kidney tissues (Caltrans 2001). The injuries caused by such pressure waves are known as barotraumas, and include hemorrhage and rupture of internal organs, as described above, and damage to the auditory system. Death can be instantaneous, can occur within minutes after exposure, or can occur several days later.

Fish respond differently to sounds produced by impact hammers than to sounds produced by vibratory hammers. Fish consistently avoid sounds like those of a vibratory hammer (Enger *et al.* 1993; Dolat 1997; Knudsen *et al.* 1997; Sand *et al.* 2000) and appear not to habituate to these sounds, even after repeated exposure (Dolat, 1997; Knudsen *et al.* 1997). On the other hand, fish may respond to the first few strikes of an impact hammer with a startle response, but then the startle response wanes and some fish remain within the potentially harmful area (Dolat 1997). Compared to impact hammers, vibratory hammers make sounds that have a longer duration (minutes vs. milliseconds) and have more energy in the lower frequencies (15-26 Hz vs. 100-800 Hz) (Würsig, *et al.* 2000).

Sound pressure levels (SPLs) greater than 150 decibels (dB)[7] root mean square (RMS) produced when using an impact hammer to drive a pile are thought to affect fish behavior. A multi-agency

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[7] All decibels have a reference pressure of one micro Pascal

work group determined that to protect listed species, sound pressure waves should be within a single strike threshold of 206 decibels (dB), and for cumulative strikes either 187 dB sound exposure level (SEL) where fish are larger than 2 grams or 183 dB SEL where fish are smaller than 2 grams (NMFS 2008c).

Surrounding the pile with a bubble curtain can attenuate the peak SPLs by approximately 28 dB and is equivalent to a 97% reduction in sound energy. Whether confined inside a sleeve made of metal or fabric or unconfined, these systems have been shown to reduce underwater sound pressure (Würsig *et al.* 2000; Longmuir and Lively 2001; Christopherson and Wilson 2002; Reyff and Donovan 2003). However, the sound attenuation achieved by bubble curtains varies greatly depending on design and location. Observed ranges have been between 3 and 28 dB (pers com John Stadler, NMFS). Thus, a bubble curtain may not bring the peak and RMS SPLs below the established thresholds, and take may still occur. Studies on pile driving and underwater explosions suggest that, besides attenuating peak pressure, bubble curtains also reduce the impulse energy and, therefore, the likelihood of injury (Keevin 1998). Because sound pressure attenuates more rapidly in shallow water (Rogers and Cox 1988), it may have fewer deleterious effects there.

Unconfined bubble curtains lower sound pressure by as much as 17 dB (85%) (Würsig *et al.* 2000, Longmuir and Lively 2001), while bubble curtains contained between two layers of fabric reduce sound pressure up to 22 dB (93%) (Christopherson and Wilson 2002). However, an unconfined bubble curtain can be disrupted and rendered ineffective by currents greater than 1.15 miles per hour (Christopherson and Wilson 2002). When using an unconfined air bubble system in areas of strong currents, it is essential that the pile be fully contained within the bubble curtain, and that the curtain have adequate air flow, and horizontal and vertical ring spacing around the pile.

NMFS has developed a spreadsheet to assess the potential effect to fishes exposed to elevated levels of underwater sound (peak and RMS pressure as well as sound exposure level (SEL)) resulting from pile driving. The distance to the thresholds of behavioral impacts and onset of physical injury can be calculated with the following information:

- Number of impact hammer strikes per pile?
- Number of hours/minutes required to drive one pile and all piles?
- Number of hours per day pile driving will occur?
- Depth of water and type of substrate the piles will be driven in?
- If an impact hammer is used, will it be the entire pile or just the last few hits per pile?
- Diameter of pile?
- Will pile-driving be continuous?
- Will be pile be straight or battered?
- Will a template be used?
- Pile type?
- When is pile-driving proposed?
- What life-stages are known to occur within the action area?
- If provided, what is the source of hydroacousitc assumptions?
- Installation plan/ schematics included?

- Pile spacing?

ESA-listed salmonids occur year-round in waters covered by this opinion. However, the likelihood of take resulting from pile driving and removal will be minimized by completing the work during preferred in-water work windows, using a vibratory hammer where possible, using sound attenuators where an impact hammer is necessary, and limiting the number of strikes per day.

New impervious surfaces. Copper is a widespread source of water pollution in salmon habitat where it is deposited by mines, urban stormwater runoff, treated wood leachate, and from algicides used in waterways and as fungicides applied to cropland (WWPI 1996, Baldwin *et al.* 2003, Weis and Weis 2004). Copper is the most frequently detected trace element at agricultural and mixed use sites in the Willamette River basin (Wentz *et al.* 1998). Stormwater from parking lots and roads associated with a project may increase metals and other contaminants into the receiving water. Animals can acquire elevated levels of these metals indirectly through trophic transfer, and may exhibit toxic effects at the cellular level (DNA damage), tissue level (pathology), organismal level (reduced growth, altered behavior and mortality) and community level (reduced abundance, reduced species richness, and reduced diversity) (Weis *et al.* 1998, Weis and Weis 2004). Effects are more severe in poorly flushed areas (Weis and Weis 2004).

Chemicals such as copper, zinc, arsenic and chromium may directly affect salmon that spawn, rear, or migrate by contaminated areas, or indirectly when the salmon ingest contaminated prey (Posten 2001). Copper has been shown to impair the olfactory nervous system and olfactory-mediated behaviors in salmonids (Hara *et al.* 1975, Winberg *et al.* 1992, Hansen *et al.* 1999a and 1999b, Baldwin *et al.* 2003). Salmon will actively avoid copper (Hansen *et al.* 1999a and 1999b), suggesting that low levels of copper present in distinct gradients, such as near point-source discharges, may act as migratory barriers to salmon. However, behavioral avoidance is not likely to be an adequate defense against non-point sources of copper in lakes, rivers and estuaries (Baldwin *et al.* 2003).

Even transient exposure lasting just a few minutes to copper at levels typical for surface waters from urban and agricultural watersheds, and within the U.S. Environmental Agency water quality criterion for copper, will cause greater than 50% loss of sensory capacity among resident coho in freshwater habitats (Baldwin *et al.* 2003). While that loss may be at least partially reversible, longer exposures lasting hours have caused cell death in the olfactory receptor neurons of other salmonid species (Julliard *et al.* 1996, Hansen *et al.* 1999b, Moran *et al.* 1992). Therefore, olfactory function will be impaired if salmon are unable to avoid copper pollution within the first few minutes of exposure and, if copper levels subsequently exceed a threshold for sensory cell death, it may take weeks before the functional properties of the olfactory system recover (Baldwin *et al.* 2003). Because olfactory cues convey important information about habitat quality (*e.g.*, pollution), predators, conspecifics, mates, and the animal's natal stream, substantial copper-induced loss of olfactory capacity is likely to impair behaviors essential for the survival or reproductive success of salmon and steelhead (Baldwin *et al.* 2003).

In-water work. Effects from in-water work are generally avoided and minimized through use of: (1) In-water work isolation strategies that often involve capture and release of trapped fish and other aquatic invertebrates, and (2) performing the work during work windows when the fewest individuals of a species are present.

Capturing and handling all fish causes them stress, though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived (NMFS 2002). The primary contributing factors to stress and death from handling are differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time that fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18^{o}C (64^{o}F) or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps, if the traps are not emptied on a regular basis. Debris buildup at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis.

Based on monitoring information from previous fish salvage operations associated with Corps permitted projects, NMFS believes that it is unlikely that eulachon or green sturgeon will be encountered during work area isolation and fish salvage.

*Dredging***.** Direct effects to fish are likely to include entrainment of fish (Dutta and Sookachoff 1975a, Boyd 1975, Armstrong *et al.* 1982, Tutty 1976) and mortality from exposure to suspended sediments (turbidity). The likely indirect effects of dredging include: (1) Behavioral changes (Sigler *et al.* 1984, Berg and Northcote 1985, Whitman *et al.* 1982, Gregory 1988) and sub-lethal impacts from exposure to increased turbidity (Sigler 1988, Sigler *et al.* 1984, Kirn *et al.* 1986, Emmett *et al.* 1988, Servizi 1988); (2) mortality from predatory species that benefit from activities associated with dredged material disposal; (3) mortality resulting from stranding as a result of vessel wakes; (4) modifications to nearshore habitat resulting from erosion as a result of vessel wakes or dredging itself; (5) loss of benthic food sources resulting from dredging and disposal of dredged material (Morton 1977); and (6) cumulative effects of increased industrialization at port facilities along the river.

NMFS does not expect clamshell dredging to entrain the listed species considered in this opinion. The action of the bucket passing through the water column should allow for salmonids to avoid it. However, hydraulic suction dredging may entrain juvenile salmonids. When fish come within the "zone of influence" of the cutter head, they may be drawn into the suction pipe (Dutta 1976, Dutta and Sookachoff 1975a). Dutta (1976) reported that salmon fry were entrained by suction dredging in the Fraser River and that suction dredging during juvenile migration should be controlled. Braun (1974a, 1974b), in testing mortality of entrained salmonids, found that 98.8% of entrained juveniles were killed. Dutta and Sookachoff (1975b) found that suction dredging operations "cause a partial destruction of the anadromous salmon fishery resource of the Fraser River." Boyd (1975) noted that suction pipeline dredges operating in the Fraser River during fry migration took substantial numbers of juveniles. As a result of these studies, the Canadian government issued dredging guidelines for the Fraser River to minimize the likelihood of entrainment (Boyd 1975). Further testing in 1980 by Arseneault (1981) resulted in entrainment of chum and pink salmon but in low numbers relative to the total of salmonids outmigrating (0.0001 to 0.0099%).

The Corps conducted extensive sampling within the Columbia River in 1985-88 (Larson and Moehl 1990) and again in 1997 and 1998. In the 1985-88 study, no juvenile salmon were entrained and the 1997-98 study resulted in entrainment of only two juvenile salmon. McGraw and Armstrong's (1990) examination of fish entrainment rates in Grays Harbor from 1978 to 1989 resulted in only one juvenile salmon being entrained. Dredging was conducted outside peak migration times. Stickney (1973) also found no evidence of fish mortality while monitoring dredging activities along the Atlantic Intracoastal Waterway. These studies were on deep water areas associated with main channels. Few data are available on the extent of entrainment in shallow-water areas, such as those associated with the side channels proposed as part of maintenance dredging.

In areas of coarse sand, NMFS expects the turbidity generated from all types of dredging to be very small and confined to the area close to the draghead or bucket. Issues involving turbidity associated with flow lane disposal were addressed in the April 6, 1993 biological opinion with the Corps for navigation channel maintenance dredging. NMFS did not believe that mortality resulting from turbidity was an issue of concern during that consultation and has no information that would change that belief for this opinion.

Dredging within the in-water work period and using best management practices (keeping the intake at or just below the surface of the material being extracted and raising it only for short periods to purge) is expected to minimize any potential impacts.

Site Preparation for Construction of Buildings and Related Features. The effects of this type of site preparation (restrooms, picnic shelters, parking lots, etc.) are likely to be less intense than those discussed in the pre-construction section above because all actions will occur outside of the riparian management area. An additional indirect effect of this activity can be intentional or opportunistic human access to riparian or instream areas. Once in the riparian zone or instream area, people may walk or hike, thus trampling soils and channel materials, and disturbing vegetation in ways that can increase runoff and reduce plant growth. They may also start fires, dump trash, or otherwise adversely alter environmental conditions. However, with due diligence for the full range of conservation measures outlined above, including the requirement that fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons, it is unlikely that environmental changes caused by these indirect effects at any single construction site associated with the proposed action, or that any combination of such construction sites, could cause chronic trampling or vegetation removal over a large habitat area sufficient to cause more than transitory indirect affects to salmon or steelhead.

Overwater Structures. An effect of overwater structures is the creation of a light/dark interface that allows ambush predators to remain in a darkened area (barely visible to prey) and watch for prey to swim by against a bright background (high visibility). Prey species moving around the structure are unable to see predators in the dark area under the structure and are more susceptible to predation.

Predatory fish in many of the areas covered by this opinion include northern pikeminnow, smallmouth bass, largemouth bass, and walleye. Predation on ESA-listed salmon and steelhead is reasonably certain to increase with the addition of structures. Juvenile fish abundance has also been found to be reduced under piers and overwater structures when compared to open water or areas with piles but no overwater structures (Able *et al.* 1998), likely due to limitations in prey abundance and increased predation under structures. Several studies have found smallmouth bass and northern pikeminnow predation on juvenile salmonids to be significant:

Fritts and Pearsons (2004) estimated that smallmouth bass in the Yakima River consumed an average of roughly 200,000 juvenile Chinook salmon yearly. They primarily ate the smallest salmon available—that is, offspring of naturally spawning ocean-type Chinook salmon (subyearlings). They further indicated that smallmouth bass predation can adversely affect native salmonids where there is spatial overlap between smallmouth bass and small-sized salmonids.

Tabor *et al.* (1993) found that juvenile salmonids made up 59% by weight of smallmouth bass diets and 28.8% by weight of northern pikeminnow diets in the Columbia River near Richland, Washington. The juvenile salmon were mostly subyearling Chinook salmon. Predation rates were high during the spring and early summer, when their habitat overlapped.

Naughton *et al.* (2004) found that juvenile salmonids comprised less than 11% (by weight) of the diet of smallmouth bass in the Lower Granite Reservoir System. They postulate that variation in juvenile salmonid consumption by smallmouth bass is common within the basin and is probably related to differing biotic and abiotic conditions.

Poe *et al*. (1991) found that juvenile salmonids composed 67% of northern pikeminnow diets (by weight) and 14% of smallmouth bass diets in John Day Reservoir. They further found that subyearling Chinook salmon were selected by smallmouth bass when their two distributions overlapped.

Zimmerman and Ward (1999) found that predation of juvenile salmonids by northern pikeminnow in the Columbia River downstream from Bonneville Dam was consistently an order of magnitude greater than at sites in Columbia and Snake River impoundments.

Tabor *et al.* (2007), in examining salmonid predation by smallmouth and largemouth bass in the Lake Washington Basin found that overall rates of predation were low, but that during certain times of year up to 50% of the smallmouth bass diet was made up of salmonids (primarily subyearlings), particularly in the Lake Washington Ship Canal. They attribute this to the relatively small size of subyearlings and their use of nearshore habitats where overlap with bass is greatest.

Chapman (2007), in evaluating the effects of dock structures on subyearling Chinook salmon in Wells Dam Pool indicates that:

- Subyearling Chinook salmon less than 60mm in length use nearshore covered habitats extensively.
- Docks may be a surrogate for lack of overhead cover.

- Pikeminnow and smallmouth bass are two major predators that would be expected to use dock structures.
- The greatest potential for predation occurs in late April, May, and to a lesser extent, early June, when subyearlings are small and the water in littoral areas warms. Once they are larger they are less susceptible.
- Docks probably increase carrying capacity of Wells Dam Pool for smallmouth bass by providing structural cover and temporary access to prey.
- To avoid increases in mortality of subyearling summer/fall Chinook salmon, placement of docks in littoral zones of Wells Dam Pool should not be undertaken.

As identified in the Draft Upper Willamette River Conservation and Recovery Plan for Chinook salmon and Steelhead (ODFW 2010), predation is a limiting factor for salmon and steelhead recovery in the Willamette River basin. There is emerging concern regarding the extent of pikeminnow, centrarchid, and walleye impacts in other reservoirs and warm water reaches throughout the Willamette River basin, such as slow water areas in sub-basins and the mainstem Willamette that are associated with the remaining floodplain. The plan indicates that the impact of exotic predators can be strengthened by land use practices and hatchery practices that congregate juvenile salmonids, and hydrologic alterations to flow that delay downstream salmonid migration and increase predator survival and productivity. Specifically, action items 64 and 83 of the draft plan recommend the following:

- Reduce the square footage of over-water structures in the estuary and lower mainstem Willamette River.
- Where possible, modify remaining overwater structures to provide beneficial habitat for salmonids.
- Inventory over-water structures in the estuary and develop a GIS layer with detailed metadata files.
- Remove or modify over-water structures to provide beneficial habitats.
- Establish criteria for new permit applications to consider the cumulative impacts of over-water structures in the estuary.
- Conduct research, monitoring, and evaluation of modifications that can be made to overwater structures to assess ecological impacts
- Manage pikeminnow and non-native piscivorous fishes to reduce predation on juvenile salmonids.
- Initiate status/trend monitoring of abundance and occurrence of pikeminnow, centrarchids, walleye, and channel catfish.
- Initiate diet studies to resolve critical uncertainty regarding impact on UWR Chinook salmon and steelhead.
- As needed and feasible, implement habitat actions that are known to prevent predator population growth or that reduces interactions with juvenile salmonids.

As identified in the 2010 Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan (Lower Columbia Fish Recovery Board 2010), predation by native and introduced fish species is a limiting factor for recovery of LCR Chinook and coho salmon, and steelhead. Evidence suggests that predation related mortality of juvenile salmonids during outmigration is substantial, thereby limiting survival and abundance of salmonids. Predation likely has always been a significant source of mortality but has been exacerbated by habitat changes. Current sources of predation on salmonids are substantial, however, how current predation levels compare to those experienced historically is unknown. Salmonids are an important food for large pikeminnow and millions of juvenile salmonids are estimated to fall prey each year. Significant numbers of salmon are lost to fish, bird, and marine mammal predators during migration through the mainstem Columbia River. Smallmouth bass (*Micropterus dolomeiui*) also have been found to consume significant numbers of juvenile salmonids. Habitat alterations in the Lower Columbia River mainstem and estuary have increased the abundance of predators of juvenile salmonids.

The State of Washington's position paper (Dugger 2005) on shading effects recommends for anything wider than 3 feet that 60% of the total coverage be grated and that the grated areas not be used for storage. They do allow for some individual exceptions in waters greater than 20 feet in depth, velocity greater than 0.7 fps and at least 50 feet from the shore (Dugger 2005). NMFS believes that the incorporation of grating covering 60% of the surface area into all of the docks allows for more light penetration and diffuses the light/dark interface and will minimize the susceptibility of juvenile salmonids to piscivorous predation resulting from these types of projects.

Stuber *et al.* (1982), in their development of a habitat suitability index model for largemouth bass found that adults are most abundant in areas of low current velocity and velocities greater than 20 cm/sec (0.7 fps) were unsuitable. Placement of overwater structures in areas with velocities greater than 0.7 fps will minimize the susceptibility of juvenile salmonids to piscivorous predation resulting from these types of projects.

Juvenile salmonid species such as spring Chinook, sockeye, and coho salmon, and up-river steelhead usually move downriver relatively quickly and in the main channel. This would aid in predator avoidance (Gray and Rondorf 1986). Fall and summer Chinook salmon are found in nearshore, littoral habitats and are particularly vulnerable to predation (Gray and Rondorf 1986).

In addition, the presence of predators may force smaller prey fish species into less desirable habitats, disrupting foraging behavior, resulting in less growth (Dunsmoor *et al.* 1991).

Placement of structures in shallow water may also disrupt migration of smaller juvenile salmonids that use nearshore areas. Boat activity and the physical presence of the structures may result in juvenile salmonid delaying passage or forcing them into deeper water areas in an attempt to go around the structures. Juvenile Chinook and coho salmon use backwater areas during their outmigration (Parente and Smith 1981). Littoral areas are important for juvenile salmonid migration (Ward *et al.* 1994). McCabe *et al.* (1986) using a 50-meter (164-foot) beach seine found extensive usage of nearshore areas in the Columbia River estuary by subyearling Chinook salmon. Ledgerwood *et al.* (1990) using a 95-meter (312-foot) beach seine fishing in depths to 6 meters (20 feet) found extensive use of nearshore habitat in the Lower Columbia River by subyearling Chinook salmon. Dawley *et al.* (1986) using a 95-meter beach seine fishing in depths to 3 meters (10 feet) found extensive use of nearshore habitat in the Lower Columbia River by subyearling Chinook salmon. Sampling by them in 1968 found nearshore usage by subyearling Chinook salmon to be 15 times greater than in the adjacent channel area and that yearling Chinook salmon, coho salmon and steelhead were more often caught in deeper waters (Dawley *et al.* 1986).

Ward *et al.* (1994) reported mean distance offshore for juvenile salmonids caught while vertical gill netting in the Willamette River to range from 39 to 93 feet with most fish caught in waters 18 feet or less in depth. This indicates that the nearshore area in the Lower Willamette River is heavily used by smaller salmonids.

Placement of structures close to the shore impacts the ability of juvenile salmonids to safely migrate past. A 312-foot beach seine effectively fishes up to 99 feet from the shore in the Columbia River, the nearshore are occupied by juvenile salmonids. It is conceivable that the nearshore area used by juveniles would be smaller on smaller stream systems. Therefore, placement of a floating structure at a minimum of 50 feet from the shoreline at OLW and MLLW, while not avoiding migration delays in the Columbia River, would minimize the potential for disruption to migration in all other stream and estuarine systems. Within the Columbia River, floating structures should be placed a minimum of 100 feet from the shoreline at OLW or MLLW to minimize potential impacts to migration.

Shading from docks, piers, boat houses, moored boats, and marinas may also reduce juvenile salmonid prey organism abundance and the complexity of the habitat by reducing aquatic vegetation and phytoplankton abundance (Kahler *et al.* 2000). Placement of dock structures in estuarine areas devoid of aquatic vegetation would avoid impacts to food resources and refugia.

Placement of piles to support the structures will likely provide for some usage by cormorants. Placement of anti-perching devices on the top of the pilings would preclude their use by any likely avian predators.

Residential structures and especially marinas are likely to have high levels of boating activity in their immediate vicinity, particularly next to floats. Specifically, floats may serve as a mooring area for boats or a staging platform for recreational boating activities. Boating activities may adversely affect listed salmonids and aquatic habitats directly through engine noise or prop movement, and the physical presence of a boat hull may disrupt or displace nearby fishes (Mueller 1980, Warrington 1999a).

Mueller (1980), in studying boating effects on long-eared sunfish found that boating affected fish behavior. Depending on speed and proximity to the nests, boats caused spawners to abandon their nests for varying periods in order to find protective shelter. Type of craft (johnboat or canoe) had no noticeable difference in effect, but speed and distance were important. Slow-moving craft (paddled or motored at 1 m (3 feet)/second) passing near a spawner chased it from its nest more often than craft moving at faster speeds. In most predation cases, speed and distance of passing craft made a large difference. Slow-moving craft, whether paddled or motored near nests chased spawners away more frequently than faster-moving craft.

Graham and Cooke (2008) studied the effects of three boat noise disturbances (canoe paddling, trolling motor, and combustion engine (9.9 hp)) on the cardiac physiology of largemouth bass (*Micropterus salmoides*). They found that exposure to each of the treatments resulted in an increase in cardiac output in all fish, associated with a dramatic increase in heart rate and a slight decrease in stroke volume, with the most extreme response being to that of the combustion engine treatment. Recovery times were the least with canoe paddling (15 minutes) and the longest with the power engine (40 minutes). They postulate that this demonstrates that fish experienced sublethal physiological disturbances in response to the noise propagated from recreational boating activities.

To NMFS' knowledge, studies on salmonid response to these activities have not been conducted, but given these fishes' similar life history and biology it is reasonable that salmonids would also react in much the same manner. This is especially important at the mouths of tributaries where adult salmonids congregate/hold prior to further upstream migration. Precluding adult salmonids from reaching spawning habitat will result in pre-spawning mortality, thus reducing their abundance.

These boating impacts indirectly affect listed fish in many ways. Turbidity may injure or stress affected fishes (see above). The loss of aquatic macrophytes may expose salmonids to predation, decrease littoral productivity, or alter local species assemblages and trophic interactions. The continual loss of bankline results in requests for bank stabilization measures that further disrupt natural stream processes. Despite a general lack of data specifically for salmonids, pollution from boats may cause short-term injury, physiological stress, decreased reproductive success, cancer, or death for fishes. Further, pollution may also affect fishes by affecting likely prey species or aquatic vegetation.

Habitat degradation and loss adversely affect inshore and riverine ecosystems critical to living marine resources. Furthermore, degradation and loss of estuarine habitat reduce salmon carrying capacity in these areas. The cumulative effects of small changes in many estuaries may have a large systematic impact on estuarine and coastal oceanic carrying capacity. Point and non-point discharges, waste dumps, eutrophication, acid rain, and other human impacts reduce this ability. Population growth and demands for international business trade along the Pacific Rim exert pressure to expand coastal towns and port facilities - resulting in net estuary losses.

The proposed siting and dimension criteria for in water structures permitted under this program will not prevent usage by predators, but it will minimize the impacts described above. Grating in the floats will minimize the success of ambush predators. Placing structures further offshore will minimize disruption to migration and the success of predators. Anti-perching devices will alleviate potential bird predation. Increasing boater awareness through signage as to the impacts associated with boating will also help to minimize boating effects.

***Site Restoration and Compensatory Mitigation*.** Except as noted below, most direct and indirect effects of proposed streambank restoration actions are the same as those for general construction discussed above, and streambank stabilization restoration actions will follow the conservation measures for general construction as applicable.

The indirect environmental effects of proposed bioengineered bank treatments are similar to those discussed above for general construction, particularly those related to ecological recovery.

Summary of Effects to Salmonids. Many environmental conditions can cause incremental differences in feeding, growth, movements, and survival of salmon and steelhead during the juvenile life stage. Construction actions that reduce the input of particulate organic matter to streams, add fine sediment to channels, or disturb shallow-water habitats, can adversely affect the ability of salmon and steelhead to obtain food necessary for growth and maintenance. Salmon and steelhead are generally able to avoid the adverse conditions created by construction if those conditions are limited to areas that are small or local compared to the total habitat area, and if the system can recover before the next disturbance. This means juvenile and adult salmon and steelhead will, to the maximum extent possible, readily move out of a construction area to obtain a more favorable position within their range of tolerance along a complex gradient of temperature, turbidity, flow, noise, contaminants, and other environmental features. The degree and effectiveness of the avoidance response varies with life stage, season, the frequency and duration of exposure to the unfavorable condition, and the ability of the individual to balance other behavioral needs for feeding, growth, migration, and territory. Chronic or unavoidable exposure heightens physiological stress thus increasing maintenance energy demands (Redding *et al.* 1987, Servizi and Martens 1991). This reduces the feeding and growth rates of juveniles and can interfere with juvenile migration, growth to maturity in estuaries, and adult migration. However, given the full range of mandatory conservation measures in the SLOPES IV program outlined above, the threat is negligible that the environmental changes caused by events at any single construction site associated with the proposed action, or even any combination of such construction sites, could cause chronic or unavoidable exposure over a large habitat area sufficient to cause more than transitory direct affects to individual salmon or steelhead.

At the population level, the effects of the environment are understood to be the integrated response of individual organisms to environmental change. Thus, instantaneous measures of population characteristics, such as population abundance, population spatial structure and population diversity, are the sum of individual characteristics within a particular area, while measures of population change, such as population growth rate, are measured as the productivity of individuals over the entire life cycle (McElhany *et al.* 2000). Lethal take associated with work area isolation or pile driving, if any, is expected to amount to no more than a few individual juveniles. That is too few to influence population abundance. Similarly, small to intermediate reductions in juvenile population density in the action area caused by individuals moving out of SLOPES IV activity areas to avoid dying as a result of exposure to short-term physical and chemical effects of the proposed construction are expected to be transitory and are not expected to alter juvenile survival rates.

Because adult salmon and steelhead are larger and more mobile than juveniles, it is unlikely that any will be killed during work area isolation although adults may move laterally or stop briefly during migration to avoid noise or other construction disturbances (Feist *et al.* 1996, Gregory 1988, Servizi and Martens 1991, Sigler 1988). However, given the full range of mandatory conservation measures in the SLOPES IV program outlined above, it is unlikely that physical and chemical changes caused by construction events at any single construction site associated with the proposed action, or even any combination of such construction sites, will cause delays severe enough to reduce spawning success and alter population growth rate, or cause straying that might alter the spatial structure or genetic diversity of populations. Thus, it is unlikely that the biological effects of actions taken under the SLOPES IV program will affect the characteristics of salmon or steelhead populations.

2.4.2 Effects on ESA-Listed Green Sturgeon and Eulachon

Less is known about southern DPS of green sturgeon and eulachon although key differences in the distribution and biology of these two species make it reasonable to assume that the effects of the proposed action on them are likely to be within range of effects described above. Both species are broadly distributed in marine areas along the western coast of North America and only enter the action area in a relatively few subtidal and intertidal areas.

In the case of southern green sturgeon, subadult and adult individuals enter the action area for non-breeding, non-rearing purposes. Impacts from construction to green sturgeon are the same as those described above for salmonids. Because of their age, location, and life history, these individuals are relatively distant from, and insensitive to, the effects of a majority of the actions described above, and those effects are unrelated to the principal factor for the decline of this species, *i.e.*, the reduction of its spawning area in the Sacramento River. Adult and subadult green sturgeon are likely to be far less sensitive to turbidity and suspended solids than salmonids. The NMFS is also reasonably certain elevated suspended sediment concentrations will result in insignificant behavioral and physical response due to the higher tolerance of green sturgeon, which usually inhabit much more turbid environments than do salmonids.

Eulachon are also limited to a relatively few subtidal and intertidal areas and the mainstem Columbia River below Bonneville Dam, but they return to those areas with a presumed fidelity that indicates close association between a particular stock and its spawning environment (Gustafson *et al.* 2008). Moreover, eulachon face numerous potential threats throughout every stage of their life cycle, although the severity of shoreline construction effects and water quality, the most significant effects described above, have been ranked as “very low” and “low,” respectively (Gustafson *et al.* 2008). The biggest impact may be from dredging actions. Limiting dredging in the Columbia River and other occupied areas to the proposed work windows is expected to result in very limited entrainment potential.

Summary of Effects to Green Sturgeon and Eulachon. Some individual green sturgeon are likely to be adversely affected by the activities covered under the SLOPES IV program described in this opinion. However, there should be few green sturgeon in the vicinity of most of the actions. Dredging and pile driving would be the most likely activities to affect individuals. The restrictions on pile driving and dredging should minimize those impacts. The impacts from these activities are not expected to result in a change at the population level.

Effects to eulachon would primarily occur as a result of dredging and pile driving activities. Work window restrictions should limit impacts to this species as a result of these activities. The impacts from these activities are not expected to result in any measurable population level effects.

2.4.3 Effects on Critical Habitat

Completion of each project is expected to have the following set of effects on the PCEs or habitat qualities essential to the conservation of each species, these effects will vary somewhat in severity between projects because of differences in the scope of construction at each, and in the current condition of PCEs and the factors responsible for those conditions. This assumption is based on the fact that all of the projects are based on the same set of underlying construction actions and the PCEs and conservation needs identified for each species are also essentially the same. In general, ephemeral effects are expected to last for hours or days, short-term effects are expected to last for weeks, and long-term effects are expected to last for months, years or decades. Actions with more significant construction component are likely to have direct adverse effects to a larger area, and to take a longer time to recover, than actions based in restoration of a single habitat element. However, they are also likely to have correspondingly greater conservation benefits.

Effects on ESA-Listed Salmon and Steelhead Critical Habitat. Essential habitat for listed salmonids includes summer and winter rearing areas, juvenile migration corridors, areas for growth and development to adulthood, and adult migration corridors, and spawning areas. Juvenile summer and winter rearing areas and spawning areas are often in small headwater streams and side channels, while juvenile migration corridors and adult migration corridors include tributaries, mainstem river reaches and estuarine areas. Growth and development to adulthood occurs primarily in near- and off-shore marine water, although final maturation takes place in freshwater tributaries when the adults return to spawn. Of these, the action area has been designated as essential for spawning and rearing, juvenile migration, and adult migration. The Pacific Ocean areas used by listed salmon for growth and development to adulthood are not well understood, and essential areas and features have not been identified for this life stage. The essential features of critical habitat for listed salmonids are substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, access and safe passage conditions.

1. Freshwater spawning sites
    a. Water quantity – Ephemeral reduction due to short-term construction, reduced riparian soil permeability, and increased riparian runoff; slight longer-term increase based on improved riparian function and floodplain connectivity.
    b. Water quality – Short-term increase in turbidity, dissolved oxygen demand, and temperature due to riparian and channel disturbance.
    c. Substrate – Short-term reduction due to increased compaction and sedimentation.
2. Freshwater rearing sites
    a. Water quantity – as above.
    b. Floodplain connectivity – Both short and long-term decrease due to increased compaction and riparian disturbance.
    c. Water quality – as above.
    d. Forage – Both short and long-term decrease due to riparian and channel disturbance, loss of benthos from shading and long-term maintenance due to replaced riparian function from mitigation.

e. Natural cover – Short-term decrease due to riparian and channel disturbance; long-term maintenance due to replaced riparian function from mitigation.

3. Freshwater migration corridors
   a. Free passage – Short-term decrease due to decreased water quality and in-water work isolation; long-term decrease due to increased predator habitat.
   b. Water quantity – as above.
   c. Water quality – as above.
   d. Forage – as above.
   e. Natural cover – as above.
4. Estuarine areas
   a. Free passage – as above.
   b. Water quality – as above.
   c. Water quantity – as above.
   d. Natural cover – as above.
   e. Juvenile forage – as above.
   f. Adult forage – Short-term decrease due to riparian and channel disturbance.
5. Nearshore marine areas
   a. Free passage – no effect.
   b. Water quality – no effects.
   c. Water quantity – no effects.
   d. Forage – no effects.
   e. Natural cover – no effect.
6. Offshore marine areas
   a. Water quality – no effect.
   b. Forage – no effect.

Effects on Green Sturgeon Critical Habitat. Critical habitat for green sturgeon includes estuarine and nearshore coastal areas that provide for rearing and migration of adult and subadults. The bays and estuaries along the Oregon coast are subject to increased human activities as populations increase and economic driven activities are developed. These activities result in the need for docks and maintaining access to them. Dredging results in stream and river-bottom disturbances that disrupt benthic production and feeding of green sturgeon, increase turbidity and change depth profiles. The essential features for green sturgeon critical habitat are food, passage, sediment quality and water quality in estuarine and coastal marine areas.

1. Estuarine areas
   a. Food - Short-term decrease due to stream and river-bottom disturbance.
   b. Passage - Short-term decrease due to stream and river-bottom channel disturbance.
   c. Sediment quality - Short-term decrease due to stream and river-bottom disturbance.
   d. Water quality - Short-term increase in turbidity, dissolved oxygen demand, and temperature due to riparian and channel disturbance.
2. Coastal Marine Areas
3. Food – No effect.
4. Passage – No effect.

5. Water Quality – No effect.

Effects on Eulachon Critical Habitat. Critical habitat for eulachon includes: (1) Freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles; (2) freshwater and estuarine migration corridors associated with spawning and incubation sites that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted; and, (3) nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival. As described in the above section on green sturgeon, the Oregon Coast is subject to increased human activities as is the Lower Columbia River. The essential features for eulachon critical habitat are

1. Freshwater spawning sites and incubation
    a. Flow – Ephemeral reduction due to short-term construction needs, reduced riparian permeability, and increased riparian runoff; slight longer-term increase based on improved riparian function and floodplain connectivity.
    b. Water quality – Short-term increase in turbidity, dissolved oxygen demand, and temperature due to riparian and channel disturbance.
    c. Substrate – Short-term reduction due to increased compaction and sedimentation and removal.
2. Freshwater and estuarine migration corridors
    a. Free passage – Short-term decrease due to decreased water quality and in-water work isolation.
    b. Flow – as above.
    c. Water quality – as above.
    d. Temperature – no effect.
    e. Food – no effect.
3. Nearshore and offshore marine foraging areas
    a. Food – no effect.
    b. Water quality – no effect.

Summary of effects to critical habitat. Due to the small nature of the SLOPES IV projects and the mandatory offsetting mitigation, the intensity of the effects, in terms of the total condition and function of PCEs, and the severity of the effects, given the recovery rate for those same PCEs, is such that the function of PCEs and the conservation value of critical habitat – including the value of critical habitat for recovery – is likely to be only mildly impaired . Similarly, the frequency of the disturbance will usually be limited to a single event or, at most, a few projects within the same watershed. Review of each project by NMFS will allow for tracking of cumulative impacts within a watershed and the ability to prohibit further permitting under the program within that watershed if necessary. Thus, it is unlikely that several projects within the same watershed, or even within the same action area, would have an important adverse effect on the function of PCEs or the conservation value of critical habitat in the action area, watershed, or designation scales.

Synthesis of Effects. The scope of each type of activity that could be authorized under the SLOPES IV program is narrowly proscribed, and is further limited by conservation measures tailored to avoid direct and indirect adverse effects of those actions on properly functioning habitat conditions. Administrative measures are in place to ensure that requirements related to the scope of actions allowed and the mandatory conservation measures (*i.e.*, design criteria) operate to limit direct lethal effects on listed fish to a few deaths associated with pile driving and isolation of in-water work areas, an action necessary to avoid greater environmental harm. All other direct adverse effects will likely be transitory and within the ability of both juveniles and adult fish to avoid by bypassing or temporarily leaving the proposed action area. Such behavioral avoidance will probably be the only significant biological response of listed fish to the SLOPES IV program. This is because areas affected by the specific projects undertaken pursuant to the SLOPES IV program are likely to be widely distributed (the frequency of the disturbance will be limited to a single event or, at most, a few projects within the same watershed) and small compared with the total habitat area; the intensity and severity of environmental effects for each project will be comprehensively minimized by targeted design criteria; and the recovery timeframe for proper functioning habitat conditions is unlikely to be appreciably reduced.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Between 2000 and 2010, the population of Oregon, grew from 3.4 to 3.8 million, an increase of approximately 12%. The population is projected to grow at a similar rate for the next 5 years. The NMFS assumes that private and state actions that have routinely occurred in the past will continue within the action area, increasing as population rises.

The most common activities reasonably certain to occur in the action area are agricultural activities, operation of non-Federal hydropower facilities, urban and suburban development, recreational activities, logging, road construction and maintenance, and metals and gravel mining. These activities are often not subject to ESA consultation and would result in some adverse effects to listed fish, and their habitat. Some of the activities, such as logging and development, are subject to regulation under state programs, and the effects to fish and stream habitats are reduced to varying degrees under these programs. These activities will result in negative effects to abundance, productivity, and spatial structure of fish at the population scale, and result in some degradation of the condition of critical habitat PCEs.

Throughout Oregon, watershed councils, Native American tribes, local municipalities, conservation groups, and others will continue to carry out restoration projects in support of listed fish recovery. Many of these actions will be covered by other programmatic consultation, or by future individual consultations, in which cases their effects will not be cumulative effects. Some of the private or state-funded actions for which funding commitments and necessary approvals already exist will not undergo consultation, and will result in beneficial cumulative effects.

These beneficial effects will be similar to those described in the Effects to Listed Species section of this opinion. These effects will result in small improvements to abundance, productivity, and spatial structure of listed fish at the population scale, and result in some improvement to the condition of critical habitat PCEs.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step of NMFS' assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Result in appreciable reductions in the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2).

Within the action area, many stream, estuarine and riparian areas have been degraded by the effects of land and water use, including road construction, forest management, agriculture, mining, urbanization, and water development. Dams and reservoirs, within the currently accessible migratory corridor, have altered the river environment and affected fish passage. The operation of water storage projects has altered the natural hydrograph of many rivers. Water impoundment and dam operations affect downstream water quality characteristics. Salmon and steelhead are exposed to high rates of natural predation during all life stages from fish, birds, and marine mammals, including harbor seals, sea lions, and killer whales. Avian and introduced fish predation on salmonids has been exacerbated by environmental changes associated with river developments. The Corps, Bonneville Power Administration, and Bureau of Reclamation have also consulted on large water management actions, such as operation of the Federal Columbia River Power System, the Umatilla Basin Project, the Willamette River Project and the Deschutes Project. The U.S. Forest Service and U.S. Bureau of Land Management consult on Federal land management throughout Oregon, including restoration actions, forest management, livestock grazing, and special use permits. Impacts to the environmental baseline from these previous actions vary from short-term adverse effects to long-term beneficial effects.

Considered in the context of this baseline, and as described above, it is unlikely that the aggregated biological effects of all projects undertaken pursuant to the SLOPES IV program will have a measurable effect on listed fish population abundance or productivity. The SLOPES projects will have such minimal, short-term and/or spatially isolated effects that, even in the aggregate, will not appreciably impact population spatial structure or diversity. The SLOPES IV program will therefore have no appreciable effect on the viability of any species addressed by this programmatic consultation.

The condition of critical habitat in the action area for species addressed in the consultation varies, but for the most part at least one physical or biological feature of critical habitat is likely to be degraded at sites where projects authorized under SLOPES IV are likely to occur. The conservation value of critical habitat (identified at the watershed scale) also varies from high to low, but for the purposes of our analysis we assume that conservation value is high at all sites where projects may be authorized under SLOPES IV. The conservation role of critical habitat within the action area is either to support successful migration of juvenile and adult life stages or to support successful spawning and rearing.

Considered in the context of this baseline, and as described in our effects analysis, implementation of the SLOPES IV program will cause short-term degradation of some critical habitat physical and biological features such as water quality. We expect all of these short-term effects to be minor and transient. The physical and biological features of critical habitat will fully and quickly recover from these minor disturbances. The short term effects will not appreciably impair the ability of this critical habitat to serve its intended conservation role.

Some projects carried out under this program will also cause longer-term effects on critical habitat physical and biological features. For instance, the free passage feature of critical habitat may be degraded at the project-site scale to do a slight increase in predation or a small increase in migration time due to the construction of an in- or over-water structure. The conservation measures applied to each project significantly reduces the severity of these effects. We assume , based on the available information and the NMFS review function built into the administrative procedures of SLOPES IV, that at most, only a few projects are likely to be authorized under SLOPES IV in any given watershed in the action area. Therefore, when considered at the watershed scale, the aggregate effects of all projects authorized under SLOPES IV will not appreciably impair the ability of critical habitat to serve its intended conservation role.

Indirect effects and the effects of interrelated and interdependent actions that are reasonably certain to occur include the continued operation and maintenance of over-water and in-water structures, associated boating activity, as well as ecological recovery actions in the construction area. The human activity will vary with the type and purpose of the structure or activity completed. Pollution and physical disruption to wetland, riparian and benthic communities and ecosystems may result through the boating actions. Sediment resuspension, water pollution, disturbance of fish and wildlife, destruction of aquatic plants, and shoreline erosion may also occur. In many areas of the state shoreline habitat is relatively untouched. In those areas, increased boating activity could result in substantial erosion and disruption of aquatic vegetation. In areas where there has been substantial revetments and riprap placement an increase in boating activity would not have as big an impact. The requirement for NMFS review and approval of the project will allow for onsite evaluation as to the appropriateness of the activity as it affects fish and their habitat.

The effects of the action must be taken together with the cumulative effects. As mentioned above, population growth in Oregon will continue resulting in future private and state actions commensurate with population increases. Some of these actions will have a Federal nexus and be subject to ESA consultation. Those not subject to ESA consultation could result in some adverse effects to listed fish, and their habitat, dependent on the caliber and extent of local and state oversight. Some restoration activities ongoing throughout the state will result in benefits to listed fish. Those activities that result in negative effects will impact abundance, productivity, and spatial structure of fish at the population scale, and result in some degradation of the condition of critical habitat PCEs.

The biological effects of the SLOPES IV program can be understood as the integrated response of individuals and populations of many, interrelated species at the community level. All populations are dependent on the physical and chemical conditions and resources at their locations, and together with these conditions and resources form ecosystems. A persistent change in the environmental conditions or resources of an ecosystem can lead to a change in the abundance of many, if not all, populations in the ecosystem and lead to development of a new community. Differences in riparian and instream habitat quality, including water chemistry, can alter trophic and competitive relationships in ways that support or weaken the populations of salmon and steelhead in relation to other more pollution tolerant species (Wentz *et al.* 1998; Williamson *et al.* 1998). However, with due diligence for the full range of proposed conservation measures outlined above, it is unlikely that physical and chemical changes due to the SLOPES IV program will cause a persistent change in the conditions or resources available relative to the total habitat area. Thus, it is unlikely that the biological effects of the SLOPES IV program will affect the characteristics of individuals and populations at the biological community level.

Our conclusions for all species addressed by this opinion are based on these, as well as the following considerations: (1) Individual review is required of each project that will be covered by SLOPES IV to ensure that its effects, combined with the aggregated effects of other SLOPES IV projects, fall within the range of actions analyzed in this opinion, that extensive activity does not occur within a watershed adversely affecting the environmental baseline, that interrelated and interdependent effects are evaluated, and that each applicable conservation measure is included as a project element or an enforceable condition of the permit document; (2) taken together, the conservation measures applied to each project will ensure that any short-term effects to water quality, habitat access, habitat elements, channel conditions and dynamics, flows, and watershed conditions will be brief, minor, and scheduled to occur at times that are least sensitive for the species' life-cycle; (3) the underlying requirement of an ecological design approach that protects and stimulates natural habitat forming processes is expected to result in authorization of many projects that will have beneficial long-term effects; and (4) the frequency of the disturbance will be limited to a single event or a few projects within the same watershed and thus there is not expected to be any significant aggregate or synergistic impact of the individual SLOPES IV projects; and (5) the individual and combined effects of all actions permitted in this way, when taken together with cumulative effects, are not expected to impair currently properly functioning habitats, appreciably reduce the functioning of already impaired habitats, or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery at the population, ESU, or DPS scale.

2.7 Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of the following 17 species considered in this opinion, or result in the destruction or adverse modification of their designated or proposed critical habitat:

- Lower Columbia River Chinook salmon
- Upper Willamette River spring-run Chinook salmon

- Upper Columbia River spring-run Chinook salmon
- Snake River spring/summer-run Chinook salmon
- Snake River fall-run Chinook salmon
- Columbia River chum salmon
- Lower Columbia River coho salmon (critical habitat not designated or proposed)
- Oregon Coast coho salmon
- Southern Oregon/Northern California coasts coho salmon
- Snake River sockeye salmon
- Lower Columbia River steelhead
- Upper Willamette River steelhead
- Middle Columbia River steelhead
- Upper Columbia River steelhead
- Snake River Basin steelhead
- Southern DPS green sturgeon
- Eulachon

2.8. Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. For purposes of this consultation, we interpret "harass" to mean an intentional or negligent action that has the potential to injure an animal or disrupt its normal behaviors to a point where such behaviors are abandoned or significantly altered.[8] Section 7(b)(4) and Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1 Amount or Extent of Take

2.8. Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to

[8] NMFS has not adopted a regulatory definition of harassment under the ESA. The World English Dictionary defines harass as "to trouble, torment, or confuse by continual persistent attacks, questions, etc." The U.S. Fish and Wildlife Service defines "harass" in its regulations as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering," 50 CFR 17.3. The interpretation we adopt in this consultation is consistent with our understanding of the dictionary definition of harass and is consistent with the U.S. Fish and Wildlife interpretation of the term.

engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. For purposes of this consultation, we interpret "harass" to mean an intentional or negligent action that has the potential to injure an animal or disrupt its normal behaviors to a point where such behaviors are abandoned or significantly altered.[9] Section 7(b)(4) and Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1 Amount or Extent of Take

The habitat that will be affected by the proposed action will not be limited at the site-specific or watershed scale. Nonetheless, the proposed action is likely to cause the injury or death of salmon and steelhead of the species considered in this Opinion as a result of:

1. Short-term impacts to water quality (*e.g.*, suspended sediment, temperature, dissolved oxygen demand and contaminants).
2. Short-term decreases in functionality of physical habitat features (*e.g.* floodplain connectivity, natural cover, riparian vegetation, instream flow, stream substrate, space, and safe passage conditions).
3. Creation or continuance of habitat conditions that favor predators (*e.g.* shade created by docks and associated boat moorage).
4. Long-term impacts to water quality, in particular from impervious surface, boating.
5. Long-term habitat disturbances (*e.g.* erosion, aquatic vegetation disruption from boating).
6. Noise and sound pressure, in particular during pile removal and installation.
7. Juvenile fish handling and dewatering during work area isolation.
8. Entrainment associated with dredging.

Juvenile life stages are most likely to be affected, although adults will sometimes also be present when in-water work windows do not exclude the entire adult migration period for all species.

[9] NMFS has not adopted a regulatory definition of harassment under the ESA. The World English Dictionary defines harass as "to trouble, torment, or confuse by continual persistent attacks, questions, etc." The U.S. Fish and Wildlife Service defines "harass" in its regulations as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). The interpretation we adopt in this consultation is consistent with our understanding of the dictionary definition of harass and is consistent with the Service's interpretation of the term.

Table 27. Pathways to incidental take by category of activity.

Activity Category	Short-term impacts to water quality (*e.g*. sediment, contamination)	Short-term decreased functionality of physical habitat features (*e.g*. natural cover)	Noise/sound pressure (pile driving)	Creation of predator habitat (*e.g*. shade, perches)	Long-term habitat disturbance (*e.g*. erosion, aquatic vegetation)	Long-term impacts to water quality	Capture and entrainment
Preconstruction, including site preparation	X	X					
Construction and dredging	X	X	X	X			X
Site restoration and compensatory mitigation	X	X					X
Existence of overwater/inwater structures		X		X	X?	X	
Boat usage associated with structures				X (moored boats)	X	X	

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional and operate across far broader temporal and spatial scales than will be affected by the proposed action. Thus, the distribution and abundance of fish within each action area cannot be predicted precisely based on existing habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be harmed or harassed if their habitat is modified or degraded by the proposed action. In such circumstances, NMFS uses the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

Short-term impacts to water quality and physical habitat features. Here, the best available indicators for the extent of incidental take associated with short-term impacts to water quality and physical habitat features are as follows:

1. The total length of stream reach that will be modified by construction each year.
2. The visible increase in suspended sediment associated with construction or dredging activities.

These variables are proportional to the amounts of harm and harassment that the proposed action is likely to cause through degradation of water quality or physical habitat. Suspended sediment is proportional to the water quality impairment that the proposed action will cause, including increased sediment, temperature, and contaminants, and reduced dissolved oxygen. Stream length is proportional to the amount of habitat that will be physically altered, including natural cover, floodplain connectivity, riparian vegetation, forage and safe passage conditions.

NMFS assumes that up 195 actions per year may be funded or carried out under this opinion, and that each action may modify up to 300 lineal feet of riparian and shallow-water habitat; therefore, modification of 58,500 linear stream feet per year is a threshold for reinitiating consultation.

In addition, NMFS assumes that an increase in sediment will be visible in the immediate vicinity of construction or dredging associated with the proposed action as well as a distance downstream, and the distance that increased sediment will be visible is proportionate both to the size of the disturbance and to the width of the wetted stream as follows (see Rosetta 2005), and whether the area is subject to tidal or coastal scour. Therefore, a further threshold for reinitiating consultation is a visible increase in suspended sediment:

1. up to 50 feet from the project area in streams that are 30 feet wide or less;
2. up to 100 feet from the discharge point or nonpoint source of runoff for streams between 30 and 100 feet wide;
3. up to 200 feet from the discharge point or nonpoint source for streams greater than 100 feet wide; and
4. up to 300 feet from the discharge point or nonpoint source for areas subject to tidal or coastal scour.

Exceeding either the total linear stream feet limit or any of the suspended sediment limits will trigger the reinitiation provisions of this opinion.

Predator-friendly structures, impervious surface, boat usage, and noise/pressure. The best available indicator for the extent of incidental take associated with: (1) The creation or continuance of habitat conditions favored by predators; (2) long-term water quality impacts from impervious surfaces and boats; (3) long-term habitat disturbances from boat usage; and (4) noise and sound pressure, is the total square footage of over-water and in-water structures created pursuant to the proposed action (except for piling projects – which has a separate extent of take surrogate discussed below).

This indicator is rationally related to the take associated with predator habitat because the amount of shade caused by structures directly reflects the square footage of the structures and is the primary source of predator-friendly habitat. Similarly, water pollution from impervious surfaces is directly related to the amount of square footage of over/in-water structures and is the primary source of long-term water pollution. This indicator is also rationally related to take associated with boat usage because there is a relationship between the square footage of over-water structures and the number of boats (and hence boat usage) they can support. Finally, this indicator is rationally related to take associated with noise and sound pressure because the square footage of over-water structures will be roughly proportional to the number of piles required (and hence the amount of noise and pressure associated with driving those piles).

The majority of over-water and in-water construction in the action area has occurred on the mainstem of the Willamette and Columbia Rivers. Since 2003, approximately 124 consultations were concluded for activities associated with docks or pilings. Within the Willamette River there were 40 dock construction and 23 piling replacement consultations. Within the Columbia River below Bonneville Dam, there were 35 dock construction and 26 piling replacement consultations. This results in an average of about 8 dock and 5 piling replacement projects per year. Not all of these consultations were for residential docks, nor was the size of the docks measured. Allowing for some population and economic growth, NMFS expects that the total number of residential docks within this geographic area that would be eligible for inclusion under the SLOPES program would not exceed 15 per year. The requirement that no dock exceed 400 square foot (sf) would result in maximum total square footage of over/in-water structures on these two rivers of approximately 6,000 sf annually. Exceeding this total 6,000 sf limit will trigger the reinitiation provisions of this opinion.

The number of piling projects is harder to determine. It is dependent on many factors such as accidental breakage or deterioration. Assuming a substantial increase, NMFS would not expect to see more than 20 permits for piling projects issued under the SLOPES IV program per year. Exceeding this limit will trigger the reinitiation provisions of this opinion.

Capture. Juvenile fish will be captured during work area isolation necessary to minimize construction-related disturbance of streambank and channel areas. Some of those fish will be injured or killed.

It is possible to estimate a numeric amount of take.

NMFS assumes that of the 195 actions per year that are likely to be funded or carried out under this opinion: (a) Approximately 70% (*i.e.*, 136 actions per year) will require in-water work area isolation; (b) each action requiring in-water work area isolation is likely to result in the capture of l00 or fewer of the 16 ESA-listed marine fish species considered in this opinion,[10] and (c) of those, less than 2% are likely to be injured or killed, including by delayed mortality, and the remainder are likely to survive with no long-term adverse effects. NMFS anticipates that up to 13,600 juvenile individuals of the fish species considered in the consultation will be captured, per year, and up to 272 juvenile individuals will be injured or killed, per year, (*i.e.*, 195 x 0.70 x 100 = 13,500; and 13,500 x 0.02 = 272) as a result of work necessary to isolate in-water construction areas. Because these fish are from different species that are similar to each other in appearance and life history, and to unlisted species that occupy the same area, it is not possible to assign this take to individual species. NMFS does not anticipate that any adult fish will be taken in this manner. Thus, the threshold for reinitiating consultation is 13, 600 juveniles captured and 272 killed. Exceeding either of these limits will trigger the reinitiation provisions of this opinion.

Entrainment. Juvenile fish will be captured by entrainment during dredging operations with a suction dredge. The use of a clamshell or bucket to dredge is less likely to entrain juveniles. Most fish that are entrained will be injured or killed. The exact number of juveniles

[10] Because of the large size of subadult and adult southern green sturgeon, NMFS assumes that they are not likely to be captured during in-water work area isolation. Juvenile and adult eulachon may be captured in this way but, due to the recent listing of eulachon, monitoring data are not yet available to estimate how many.

that would be entrained cannot be determined due to extensive variables. Here the best indicator of take is the number of permits issued per year for dredging activities. Since 2001, NMFS has completed 180 consultations on dredging operations for the 10 year period ending at the end of 2011. Assuming a slight increase in rate of dredging (due to changes in river flows as a result of climate change), NMFS would not expect to see more than 20 permits issued under the SLOPES IV program in a given year. Exceeding this limit will trigger the reinitiation provisions of this opinion.

2.8.2 Effect of the Take

In the accompanying biological opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species.

2.8.3 Reasonable and Prudent Measures and Terms and Conditions

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). "Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These terms and conditions must be implemented for the exemption in section 7(o)(2) to apply.

Reasonable and Prudent Measures

The following measures are necessary and appropriate to minimize the impact of incidental take of listed species from the proposed action.

The Corps shall:

1. Implement appropriate design criteria for each activity or attach them as required conditions of a permit.
2. Ensure completion of a monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

Terms and Conditions

The measures described below are non-discretionary, and must be undertaken by the Corps or, if an applicant is involved, must become binding conditions of any permit or grant issued to the applicant. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) will likely lapse.

1. To implement reasonable and prudent measure #1 (proposed design criteria), the Corps shall ensure that:

   a. Every action authorization or completed under this opinion will be administered by the Corps consistent with design criteria 1 through 10.
   b. For each action with a general construction element, the Corps will apply design criteria 1 through 10 and 11 through 27 as enforceable permit conditions or as final project specifications.
   c. For specific types of in-water or over-water actions, the Corps will apply design criteria 28 through 36, as appropriate, as enforceable conditions or as final project specifications.
   d. Additional excluded areas for dock placement includes any area within 1,000 feet of a tributary that supports a run of ESA listed anadromous species.
   e. Residential piers leading to ramps and floats are not wider than 8 feet.
   f. Within 10 days of completing a capture and release as part of an action completed under the SLOPES IV In-water Over-water Structures programmatic opinion the applicant or, for Corps civil works actions, the Corps, must submit a complete a Salvage Reporting Form (Appendix C), or its equivalent, with the following information to NMFS at slopes.nwr@noaa.gov.

2. To implement reasonable and prudent measure #2 (monitoring and reporting), the Corps shall ensure that:

   a. The Corps' Regulatory and Civil Works Branches will each submit a monitoring report to NMFS by February 15 each year that describes the Corps' implementation of the SLOPES IV program under the terms of this opinion. The report will include an assessment of overall program activity, a map showing the location and type of each action authorized and carried out under this opinion, and any other data or analyses the Corps deems necessary or helpful to assess habitat trends because of actions authorized under this opinion, and to assess the need for reinitiation[11].
   b. The Corps' Regulatory and Civil Works Branches will each attend an annual coordination meeting with NMFS by March 31 each year to discuss the annual monitoring report and any actions that will improve conservation under this opinion, or make the program more efficient or more accountable.

Failure to provide timely reporting would be a breach of these terms and conditions and thus the exemption in section 7(o)(2) would cease to apply. Failure to timely report may also provide grounds for reinitiation.

[11] This report should also include all the monitoring data that is relevant to take, i.e. number of fish injured or killed in connection with juvenile capture, the total linear feet of stream modified, the total square footage of floating structures placed in the Willamette and Columbia Rivers under the program, the total square footage of over-water and in-water structures created pursuant to the proposed action state-wide, and sediment monitoring,

2.9. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). The following conservation recommendation is a discretionary measure that NMFS believes is consistent with this obligation and therefore should be carried out by the Federal action agency:

The Corps should conduct an analysis of boating activity (existing, proposed, and likely to be developed in the near future) on the Willamette River. This includes the number of public and private docks, launches, marinas and upland storage facilities, the types of boating activities and the seasonality of the usage, and the likely cumulative effects of the activity on the recovery of ESA-listed anadromous salmonid populations in the Willamette River.

Please notify NMFS if the Federal action agency carries out any of these recommendations so that we will be kept informed of actions that are intended to improve the conservation of listed species or their designated critical habitats.

2.10 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal action agency involvement or control over the action has been retained, or is authorized by law, and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.11 "Not Likely to Adversely Affect" Determinations

Steller Sea Lion. The eastern DPS of the Steller sea lion ranges from southeast Alaska south through California with an abundance estimated between 45,000 and 51,000 animals, an increase of 3% per year for 30 years. The northern portion of the Steller sea lion's range, Southeast Alaska and British Columbia, account for 82% of total pup production while the southern and central California portion has experienced large declines (-90%). In Oregon, the total number of non-pup sea lions at the two rookeries (Rogue Reef and Orford Reef) and eight haulout sites has increased from 1,461 in 1977 to 4,169 in 2002, an annual rate of increase of 3.7%. As of 2002, the Oregon Steller sea lion abundance is approximately 5,000 animals (NMFS 2006b). Because of the current abundance of Steller sea lions and population increase over the last 30 years, current threats to recovery have not been identified. However, there are concerns regarding global climate change and the potential for the southern California range of sea lions to be adversely affected. The May 2006 draft of the Steller Sea Lion Recovery Plan suggests initiating a status review for the eastern DPS for consideration of removing it from the federal List of Endangered Wildlife and Plants (NMFS 2006b).

Steller sea lions spend most of their time at sea feeding on a variety of fish species. The Steller sea lion is not known to migrate, but they disperse widely outside the breeding season (late May to early July) (Angliss & Outlaw 2005). Primary terrestrial habitats include remote islands, rocks, reefs, and beaches, often in areas exposed to wind and waves, where access by terrestrial predators is limited (NMFS 1992). Females appear to select birthing areas (known as rookeries) that are gently sloping and protected from waves; they will frequently return to the same pupping site in successive years. Pups normally stay on land for about two weeks (NMFS 1992), then spend an increasing amount of time in waters adjacent to rookeries, as will post-parturient females whose foraging range (usually in shallow waters within 20 nautical miles of the rookery) is restricted by the need to return to the rookery to nurse pups (58 FR 45269).

In addition to rookeries, haulouts are essential habitat for Steller sea lions. In Oregon, Steller sea lions may be found hauled out at Astoria East Mooring Basin and at the end of the South Jetty of the Columbia River, and also at Tillamook Rock, Three Arch Rocks, Cascade Head, Seal Rock, Sea Lion Caves, Cape Arago, Rogue Reef, Blacklock Point, Blanco Reef, Orford Reef, and Mack Reef. These haulouts can be used any time of the year. In addition, Steller sea lions have been observed foraging up to 8 miles upriver on the Rogue River during the spring and fall Chinook salmon runs. Small numbers of Steller sea lions may be found in the lower Rogue River at any time of the year since the largest rookery in the State is located just 2 miles northwest of the river mouth. Steller sea lions have also been observed foraging in the Columbia River as far upriver as Bonneville Dam (RM 146), primarily during the fall and spring salmon migration periods and during the winter smelt run. In Oregon, Steller sea lions may be found at any of the above-listed rookeries, haulout areas, or river mouths at any time of year; however, most occurrences in Oregon are during June and July, which corresponds with the Steller sea lion’s reproduction period.

The Columbia River south jetty is used only as a haulout site with no known reproductive activity occurring there. Use has been observed only at the far west end of the jetty. Use can occur anytime of the year with the lowest abundance (approximately 200 to 300 individuals) from April through October. In winter, Steller sea lion abundance on the south jetty may be as high as 1,500 animals.

Critical habitat for the Steller sea lion was designated on September 27, 1993 and includes (in Oregon) an air and aquatic zone that extends 3,000 feet from any historically occupied sea lion rookery (58 FR 45269). In Oregon, the major rookeries designated as critical habitat are the Rogue Reef Pyramid Rock Site, the Orford Reef Long Brown Rock Site, and the Seal Rock Site (58 FR 45269). Not all known Steller sea lion locations in Oregon have been designated as critical habitat. The Three Arch National Wildlife Refuge in Tillamook County has a smaller, less successful rookery that is not designated, but is protected by a 500- foot buffer enforced by the Oregon Marine Board. Haulouts in Oregon are not included in critical habitat designation (58 FR 45269). For regulatory purposes, rookeries and haulout boundaries are defined as the mean lower-water mark (58 FR 45269).

Effects to Steller sea lions will primarily result from impacts associated with pile driving during construction. NMFS does not expect impacts to accrue from the other activities considered in this opinion.

NMFS reviewed projects since 2009 that would be covered under this programmatic biological opinion to determine the timing duration and potential impacts to Steller sea lions. Of the 16 projects that discussed total construction time needed for completion, 4 were for boat ramps, 5 for boat docks, and 8 for piling replacement. Time to complete a boat ramp ranged from 8 to 14 days. Time to construct a boat dock ranged from 2 to 27 days, depending on the size of the dock. Time to complete pile driving ranged from 2 days to 25 days. The number of days was dependent on the number of piles to be driven, with an average of 3 to 5 piles being driven in any one day. This indicates that the majority of the projects that would be covered under this opinion would be completed in a relatively short period of time, minimizing the potential to impact Steller sea lions.

NMFS uses conservative thresholds of sound exposure levels from broad band impulse sounds that cause behavioral disturbance (160 dB rms re: 1μPa) and injury (190 dB rms re: 1μPa for pinnipeds) (70 FR 1871). Pile driving will produce sound pressure waves with source levels above the 160 dB rms threshold for disturbance of marine mammals. The use of bubble curtains would reduce these impacts to levels that would not result in injury, but some disturbance would occur if they are present in the action area. NMFS expects that the design criteria requiring use of a monitoring plan and cessation of pile driving if Steller sea lions approach the work area would further minimize any potential impacts. Further design criteria that restrict pile driving in the Columbia River to the months of October and November would alleviate impacts, since Steller sea lions normally do not occur there during those months. Use of the proposed monitoring plan for Steller sea lions would also alleviate impacts.

Based on these minimization measures, NMFS finds that the effects of the proposed action are expected to be insignificant and/or discountable, and thus are not likely to adversely affect Steller sea lions.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the Federal action agency and descriptions of EFH contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce for coastal pelagic species (PFMC 1998), Pacific Coast groundfish (PFMC 2005), or Pacific Coast salmon (1999)

3.1 Essential Fish Habitat Affected by the Project

The proposed action will affect EFH designated for coastal pelagic species, Pacific Coast groundfish, and Pacific Coast salmon, including estuaries designated as habitats areas of particular concern (HAPCs).

3.2 Adverse Effects on Essential Fish Habitat

As described fully in the preceding sections, adverse effects may result from all of the proposed actions as follows:

- Preconstruction surveys may remove vegetation that will reduce or eliminate habitat, and increase turbidity.
- Construction activities may result in increased turbidity, contaminant release from fuel spills, sound pressure waves from pile driving, and increased predation from altered habitats that are preferred by predators.
- Boating activities may result in loss of aquatic vegetation and shoreline alteration.
- Access maintenance may increase turbidity and decrease prey abundance (short-term).
- Water quality may have an ephemeral reduction due to short-term construction needs, reduced riparian permeability, and increased riparian runoff; slight longer-term increase based on improved riparian function and floodplain connectivity.
- Water quality may be affected by a short-term increase in turbidity, dissolved oxygen demand, and temperature due to riparian and channel disturbance.
- Substrate may be affected by a short-term reduction due to increased compaction and sedimentation.
- Floodplain connectivity may have both a short and long-term decrease due to increased compaction and riparian disturbance.
- Forage may have both a short and long-term decrease due to riparian and channel disturbance, loss of benthos from shading and long-term maintenance due to replaced riparian function from mitigation.
- Natural cover may have a short-term decrease due to riparian and channel disturbance; long-term maintenance due to replaced riparian function from mitigation.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS expects that full implementation of this EFH conservation recommendation would protect EFH, by avoiding or minimizing the adverse effects described in Section 3.2 above.

1. As appropriate to each action issued a regulatory permit under this opinion, NMFS recommends that the Corps include the project design criteria for administration,

construction, and types of actions as enforceable permit conditions, except #1 (confirm ESA-listed fish presence), #6 (salvage notice), and #20 (fish capture and release).

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Federal action agency must provide a detailed response in writing to NMFS within 30 days after receiving an EFH conservation recommendation from NMFS. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH conservation recommendations, unless NMFS and the Federal action agency have agreed to use alternative time frames for the Federal action agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS' conservation recommendations, the Federal action agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects, 50 CFR 600.920(k)(1).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH response and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The (Federal action agency) must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations, 50 CFR 600.920(l).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these Data Quality Act (DQA) components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility: Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users are the Corps and applicants for a Corps permit involving in-water or over-water structures.

A copy was provided to the Corps with directions to provide a copy of relevant part to any successful applicant for a permit involving in-water or over-water structures. This consultation will be posted on the NMFS Northwest Region website (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

4.2 Integrity: This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, *et seq*., and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this opinion/EFH response contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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APPENDIX A: E-MAIL GUIDELINES FOR SLOPES IV IN-WATER OVER-WATER STRUCTURES & SLOPES IV-IN-WATER/OVERWATER STRUCTURES ACTION NOTIFICATION FORM

E-MAIL GUIDELINES FOR SLOPES IV PROGRAMMATIC

The **SLOPES IV** programmatic e-mail box (slopes.nwr@noaa.gov) is to be used for actions submitted to the National Marine Fisheries Service (NMFS) by the Federal Action Agencies for formal consultation (50 CFR § 402.14) under SLOPES IV.

The Federal Action Agency must ensure the final project is being submitted to avoid multiple submittals and withdrawals. In rare occurrences, a withdrawal may be necessary and unavoidable. In this situation, please specify in the e-mail subject line that the project is being withdrawn. There is no form for a withdrawal, simply state the reason for the withdrawal and submit to the e-mail box, following the email titling conventions. If a previously-withdrawn notification is resubmitted later, this resubmittal will be regarded as a new action notification.

An automatic reply will be sent upon receipt, but no other communication will be sent from the programmatic e-mail box; this box is used for **Incoming Only**. All other pre-decisional communication should be conducted **outside** the use of the slopes.nwr@noaa.gov e-mail.

The Federal Action Agency will send only **one** project per e-mail submittal, and will attach all related documents. These documents **must be in pdf format** and will include the following:

1. Action Notification Form, the Action Completion Form, or the Salvage Report, Restoration/Compensatory mitigation Report
2. Map(s) and project design drawings (if applicable);
3. Final project plan.

In the subject line of the email (see below for requirements), clearly identify which SLOPES IV programmatic you are submitting under (Restoration, In-Water/Over-Water Structures, or Transportation), the specific submittal category (30-day approval, project completion, withdrawal, salvage report, or restoration/compensatory mitigation), the Corps Permit Number, the Applicant Name, County, Waterway, and State.

E-mail Titling Conventions

Use caution when entering the necessary information in the subject line. **If these titling conventions are not used, the e-mail will not be accepted.** Ensure that you clearly identify:

1. Which SLOPES IV programmatic you are submitting under (Restoration, In-water/Over-water Structures, or Transportation);
2. The specific submittal category (30-day approval, action completion, withdrawal, salvage report, or restoration/compensatory mitigation report);
3. Corps Permit number;
4. Applicant Name (you may use last name only, or commonly used abbreviations);
5. County;
6. Waterway; and
7. State.

Examples:

(SLOPES IV Programmatic Specific Submittal Category, Corps Permit #, Applicant Name, County, Waterway, State)

Action Notification

In-Water Over-Water, 200600999, Smith, Multnomah, Willamette, Oregon

Project Completion

In-Water Over-Water _Completion, 200600999, Smith, Multnomah, Willamette, Oregon

Salvage Report

In-Water Over-Water _Salvage, 200600999, Smith, Multnomah, Willamette, Oregon

Restoration/Compensatory Mitigation

In-Water Over-Water _Restoration/Mitigation_200600999, Smith, Multnomah, Willamette, Oregon

Withdrawal

In-Water Over-Water _Withdrawal, 200600999, Smith, Multnomah, Willamette, Oregon

Project Description

Please provide enough information for NMFS to be able to determine the effects of the action and whether the project fits the SLOPES criteria. Attach additional sheets if necessary. The project description should include information such as (but not limited to):

- Proposed in-water work including timing and duration
- Work area isolation and salvage plan including pumping, screening, electroshocking, fish handling, *etc.*
- Discussion of alternatives considered
- Description of any proposed mitigation
- Cross-section to show depth of over- and in-water structures.

SLOPES IV PROGRAMMATIC – IN-WATER OVER-WATER STRUCTURES ACTION NOTIFICATION FORM

Submit this completed action notification form with the following information to NMFS at slopes.nwr@noaa.gov. The SLOPES IV Programmatic e-mail box is to be used for **Incoming Only**.

NMFS Review and Approval. All actions must be individually reviewed and approved by NMFS as consistent with this opinion before that action is authorized. NMFS will notify the Corps within 30 calendar days if the action is approved or disqualified. Attach engineering designs and the results of a site assessment for contaminants to identify the type, quantity, and extent of any potential contamination.

Attach a copy of the erosion and pollution control plan, if required.

DATE OF REQUEST: ______________________ **NMFS Tracking #: 2011/05585**

Statutory Authority: ☐ ESA ONLY ☐ EFH ONLY ☐ ESA & EFH INTEGRATED

Lead Action Agency: **Corps of Engineers**

Action Agency Contact: ______________________ Individual Corps Permit #: ______________

Applicant: ______________________ Individual DSL Permit #: ______________

Action Title: ____

6th Field HUC & Name: ____

Latitude & Longitude (including degrees, minutes, and seconds) ____

Proposed Project: ***Start Date:*** ______________ ***End Date:*** ______________

Action Description:

Type of Action:
Identify the type of action proposed.

☐ In-water Over-water Structure
☐ Access Maintenance
☐ Piling Installation or Removal

- *What is the number of impact hammer strikes per pile?* ______________________
- *What is the number of hours/minutes required to drive one pile and all piles?* ______________________
- *What is the number of hours per day pile driving will occur?* ______________________
- *What is the depth of water and type of substrate the piles will be driven in?* ______________________
- *If an impact hammer is used, will it be the entire pile or the last few hits per pile?* ______________________
- *What is the diameter of the piles?* ______________________
- *Will pile-driving be continuous?* ______________________
- *Will be pile be driven straight or battered?* ______________________
- *Will a template be used?* ______________________
- *Pile type (H, round, etc)?* ______________________
- *When is pile-driving proposed?* ______________________
- *What life-stages are known to occur within the action area.* ______________________
- *If provided, what is the source of hydroacousitc assumptions?* ______________________
- *Installation plan/ schematics included?* ______________________
- *Pile spacing?* ______________________

NMFS Species/Critical Habitat Present in Action Area:
Identify the species found in the action area:

Species:
- ☐ Lower Columbia River Chinook
- ☐ Upper Willamette River spring-run Chinook
- ☐ Upper Columbia spring-run Chinook
- ☐ Snake River spring/summer run Chinook
- ☐ Snake River fall-run Chinook
- ☐ Columbia River chum
- ☐ Lower Columbia River coho
- ☐ Oregon Coast coho salmon
- ☐ Southern Oregon/Northern California coasts coho
- ☐ Snake River sockeye
- ☐ Lower Columbia River steelhead
- ☐ Upper Willamette River steelhead
- ☐ Middle Columbia River steelhead
- ☐ Upper Columbia River steelhead
- ☐ Snake River Basin steelhead
- ☐ Southern Green sturgeon
- ☐ Eulachon

- ☐ Steller sea lion

EFH
- ☐ Salmon
- ☐ Coastal Pelagics
- ☐ Groundfish

Terms and Conditions:

Check the Terms and Conditions from the biological opinion that will be included as conditions on the permit issued for this proposed action. Please attach the appropriate plan(s) for this proposed action.

Administrative

- ☐ Site access
- ☐ Salvage notice
- ☐ Action completion report
- ☐ Site restoration/mitigation report

Construction

- ☐ Pollution/erosion control
- ☐ Stormwater management
- ☐ Site restoration
- ☐ Compensatory mitigation
- ☐ Preconstruction activity
- ☐ Site preparation
- ☐ Heavy equipment
- ☐ In-water work period
- ☐ Work area isolation
- ☐ Capture and release
- ☐ Piling installation
- ☐ Impact hammer usage
- ☐ Pile driving near Stellar sea lions
- ☐ Piling removal
- ☐ Broken or intractable piling
- ☐ Treated wood
- ☐ Treated wood removal

Action Type

In-water Over-water Structure

- ☐ Boat ramps
- ☐ Educational signs
- ☐ Flotation material
- ☐ New or replacement floats
- ☐ Piscivorous birds
- ☐ Relocation of existing structures
- ☐ Repair/replacement of covered moorage/boat houses

Access Management

- ☐ Maintenance dredging

Minor Discharge

- ☐ Minor discharge

APPENDIX B: SLOPES IV- IN-WATER OVER-WATER STRUCTURES ACTION COMPLETION FORM

SLOPES IV Programmatic – In-water Over-water Structures Action Completion Form

Within 60 days of completing all work below ordinary high water (OHW) as part of an action completed under the SLOPES IV In-water Over-water Structures programmatic opinion, submit the completed action completion form with the following information to NMFS at slopes.nwr@noaa.gov.

Corps Permit #: ____________________

Corps Contact: ____________________

Action Title ____________________

Start and End Dates for the completion of in-water work:	***Start***: __________	***End***: __________
Any Dates work ceased due to high flows:	__________	__________
	__________	__________
	__________	__________
	__________	__________

Include With This Form:

1. Photos of habitat conditions before, during, and after action completion
2. Evidence of compliance with fish screen criteria for any pump used
3. A summary of the results of pollution and erosion control inspections, including any erosion control failure, contaminant release, and correction effort
4. Number, type, and diameter of any pilings removed or broken during removal
5. A description of any riparian area cleared within 150 feet of OHW
6. Linear feet of bank alteration
7. A description of site restoration
8. A completed Salvage Reporting Form from Appendix D for any action that requires fish salvage
9. As-Built drawings for any action involving riprap revetment, stormwater management facility, or bridge rehabilitation or replacement

APPENDIX C: SLOPES IV- IN-WATER OVER-WATER STRUCTURES SALVAGE REPORTING FORM

SLOPES IV PROGRAMMATIC – IN-WATER OVER-WATER STRUCTURES SALVAGE REPORTING FORM

Within 10 days of completing a capture and release as part of an action completed under the SLOPES IV In-water Over-water Structures programmatic opinion, the applicant or, for Corps civil works actions, the Corps, must submit a complete a Salvage Reporting Form, or its equivalent, with the following information to NMFS at slopes.nwr@noaa.gov.

Corps Permit #: ____

Corps Contact: ____

Action Title ____

Date of Fish Salvage Operation: ________________________

Supervisory Fish Biologist (name, address & telephone number): ________________________

Include With This Form:

1. A description of methods used to isolate the work area, remove fish, minimize adverse effects on fish, and evaluate their effectiveness.
2. A description of the stream conditions before and following placement and removal of barriers.
3. A description of the number of fish handled, condition at release, number injured, and number killed by species.

APPENDIX D: SLOPES IV- IN-WATER OVER-WATER STRUCTURES RESTORATION/COMPENSATORY MITIGATION REPORTING FORM

SLOPES IV PROGRAMMATIC – IN-WATER OVER-WATER STRUCTURES RESTORATION/COMPENSATORY MITIGATION REPORTING FORM

By December 31 of any year in which the Corps approves that the site restoration or compensatory mitigation is complete, the Corps, must submit a complete a Site Restoration/Compensatory Mitigation Reporting Form, or its equivalent, with the following information to NMFS at slopes.nwr@noaa.gov.

Corps Permit #: ______________________________

Corps Contact: ______________________________

Action Title: ______________________________

Type of Activity: ________________

____

Include With This Form:

1. Photos of habitat conditions before, during, and after action completion
2. Start and end date for the work
3. A summary of the results of mitigation or restoration work completed